

FMFM 6-4A

M60 MACHINEGUN



U.S. MARINE CORPS

M60 MACHINEGUN

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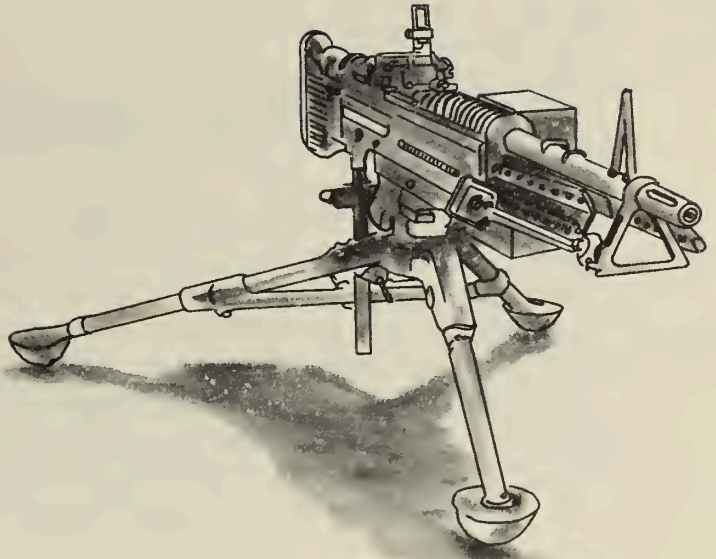
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CHAPTER 1

MECHANICAL TRAINING

Section I. INTRODUCTION

1101. GENERAL

This M60 machinegun manual is written for all Marines. It includes mechanical training, marksmanship, and technique of fire. It may be used by instructors, students, and machinegunners as a guide, reference, and source of techniques. This manual is phrased in the terms of the rifle company table of organization, but its principles apply to all units employing the M60 machinegun.

1102. IMPORTANCE OF THE MACHINEGUN

The machinegun supports the infantryman in offensive and defensive combat. It provides him with a heavy volume of controlled and accurate fire that is beyond the capability of individual small arms. The M60

machinegun can engage predetermined targets under all conditions of visibility. The final protective fires of machineguns are the basis for all defensive fire planning within the infantry battalion.

1103. DESCRIPTION

The M60 machinegun is a belt fed, gas operated, air cooled, automatic weapon. (See figs. 1 and 2.) It fires from an open bolt and is fed by a disintegrating belt of metal links. The gas from firing one round provides the energy for firing the next. Thus, the gun functions automatically as long as it is supplied with ammunition and its trigger is held to the rear. The M60 may be fired from pedestal, bipod, or tripod mounts or as a shoulder weapon. Its barrel can be changed in three seconds. This feature allows rapid cooling and accounts for the M60's increased rates of fire over those of less modern machineguns.



Figure 1. --Left Side of M60 Machinegun, Bipod Mounted.

1104. SIGHTS

The M60 has a front sight permanently affixed to the barrel. The rear sight leaf is mounted on a spring-type dovetail base. (See fig. 2.) It can be folded forward to the horizontal when the gun is to be moved. The range plate on the sight leaf is marked for each 100 meters, from

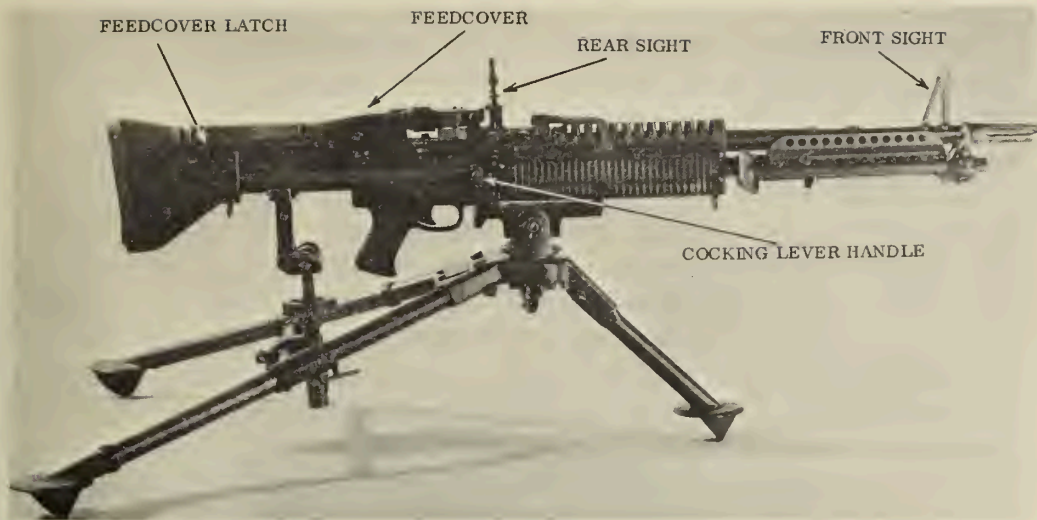


Figure 2. --Right Side of M60 Machinegun, Tripod Mounted.

300 meters to the maximum effective range of 1,100 meters. Range changes may be made by using the rear sight slide. The slide release is used for making major changes in elevation. The elevating knob is used for fine adjustments, such as during zeroing. Four clicks on the elevating knob equals a 1-mil change of elevation. The sight is adjustable for windage five mils right and left of zero. The windage knob is located on the left side of the sight. One click on the windage knob equals a 1-mil change of deflection.

1105. GENERAL DATA

Ammunition -----	7.62mm ball, tracer, blank, and dummy
Length -----	43.5 inches
Weight -----	23.2 pounds
Weight of M122 tripod -----	19.5 pounds
Weight of spare barrel case, complete -----	13 pounds (rubberized case) 16.5 pounds (canvas case)
Height of gun on tripod -----	16.5 inches
Rates of fire	
Sustained -----	100 rounds per minute
Rapid -----	200 rounds per minute
Cyclic -----	550 to 600 rounds per minute

Maximum range ----- 3725 meters (approximate)
Maximum effective range ----- 1100 meters
Elevation, tripod, controlled -- 265 mils
Depression, tripod,
 controlled ----- 200 mils
Elevation, tripod, free ----- 445 mils
Depression, tripod, free----- 445 mils
Traverse, tripod, traversing
 bar ----- 875 mils (425 left and 450 right)
Traverse, tripod, traversing
 handwheel ----- 100 mils
Traverse, free ----- 6400 mils

Section II. DISASSEMBLY, ASSEMBLY, AND NOMENCLATURE

1201. GENERAL

The M60 machinegun can be disassembled and assembled without the use of force. As parts are removed, they should be placed on a clean, flat surface. This will prevent the loss of parts and aid in reassembly since the parts are replaced in reverse order. Nomenclature is learned during disassembly and assembly. This is accomplished by naming each part as it is removed and replaced. Disassembly and assembly should be kept to the minimum consistent with training and maintenance requirements. There are two types of disassembly and assembly: general and detailed. With the exception of the barrel group, all disassembly by troops is accomplished with the aid of a cartridge or any other pointed object. All disassembly shown in this manual may be performed by using troops. Disassembly beyond the scope of this manual is performed by ordnance personnel only.

1202. GENERAL DISASSEMBLY

General disassembly is the separation of the six major groups of the machinegun. They are the butt stock group, the buffer group, the operating group, the trigger housing group, the barrel group, and the receiver group. (See fig. 3.) The step-by-step procedures for general disassembly are outlined below.

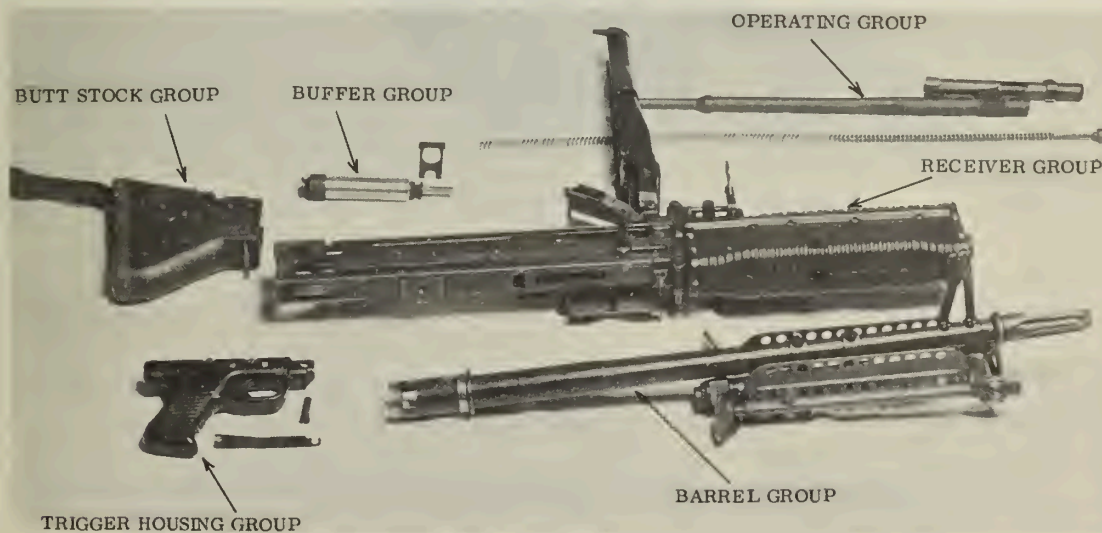


Figure 3. --Six Main Groups.

a. Determine That the Gun Is Clear

(1) Raise the feedcover by turning the feedcover latch. (See fig. 2.)

(2) Place the safety on fire, pull the cocking lever handle to the rear and return it forward, and return the safety to safe.

(3) Raise the feedplate and visually inspect the chamber.

(4) If the chamber is clear, place the safety on fire and let the bolt go forward by pulling the trigger. The gun is now considered clear.

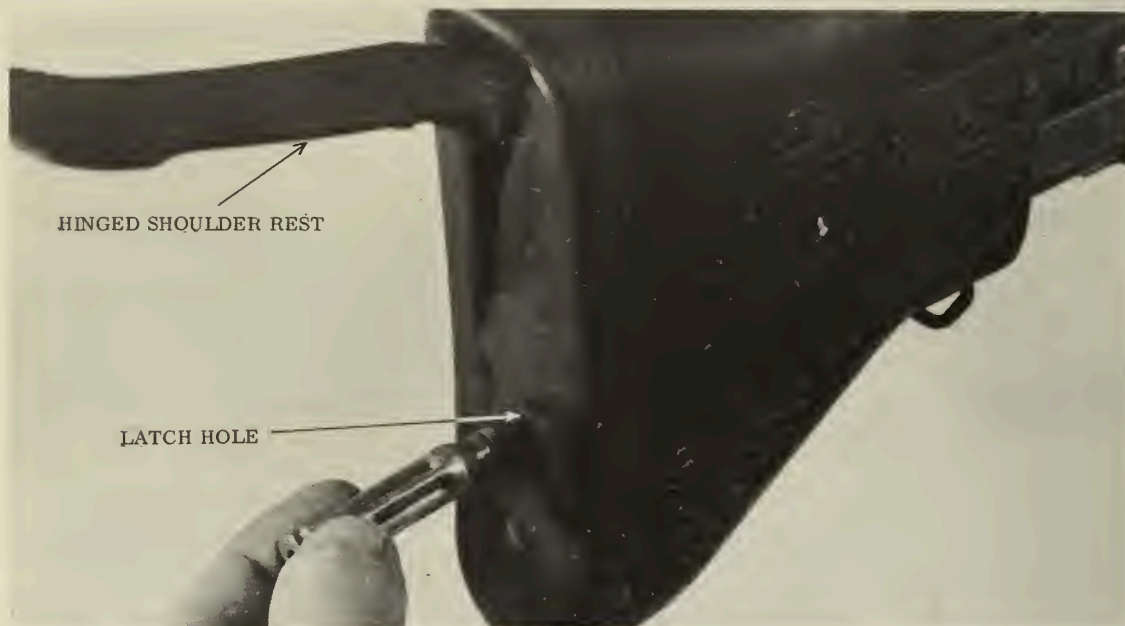


Figure 4. --Depressing the Latch.

b. Butt Stock Group

(1) Raise the hinged shoulder rest and insert the nose of a dummy cartridge in the latch hole. (See fig. 4.)

(2) Depress the latch and remove the butt stock by pulling it to the rear. (See fig. 5.)



Figure 5. --Removing the Butt Stock Group.

(3) Only qualified ordnance personnel are authorized to perform further disassembly of this group.

c. Buffer Group

(1) Hold the palm of the hand against the rear of the exposed buffer and press forward lightly. (See fig. 6.)

(2) Remove the buffer locking plate from its recess in the top of the receiver. (See fig. 6.)

(3) Remove the buffer slowly to the rear. This allows the operating rod drive spring to expand until the head of the operating rod drive spring is exposed at the rear of the receiver.

(4) The buffer group consists of the buffer and the buffer locking plate. (See fig. 7.)

(5) Only qualified ordnance personnel are authorized to perform further disassembly of this group.

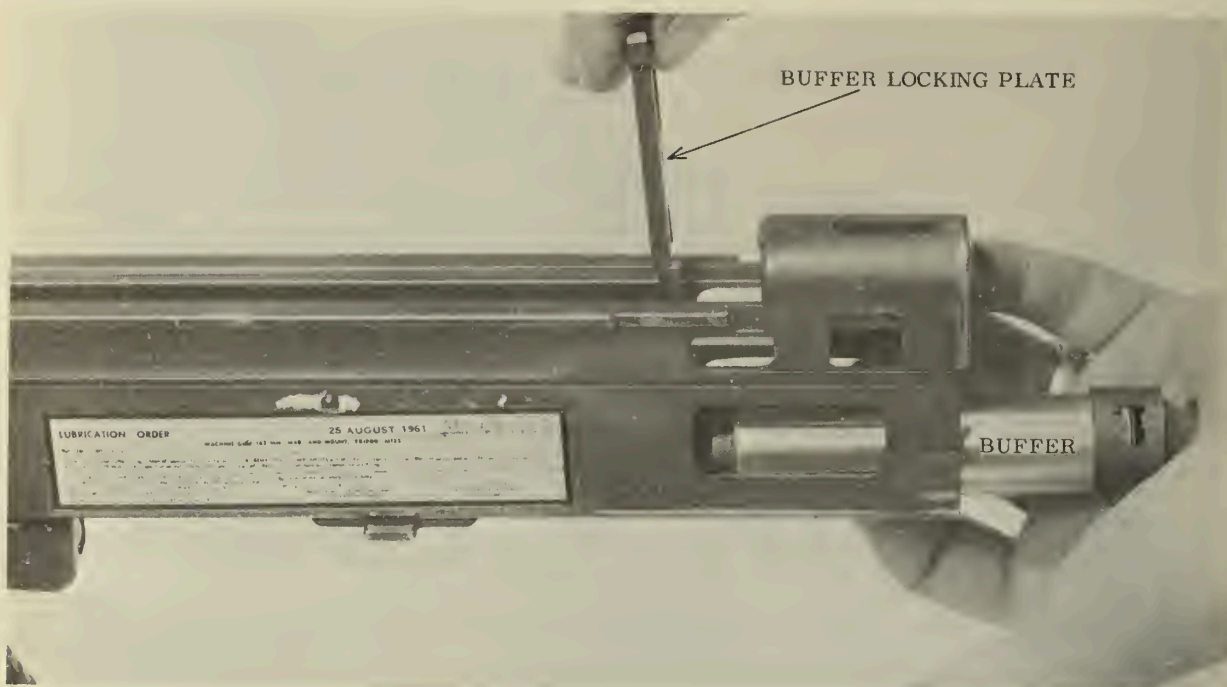


Figure 6. --Removing the Buffer Locking Plate.

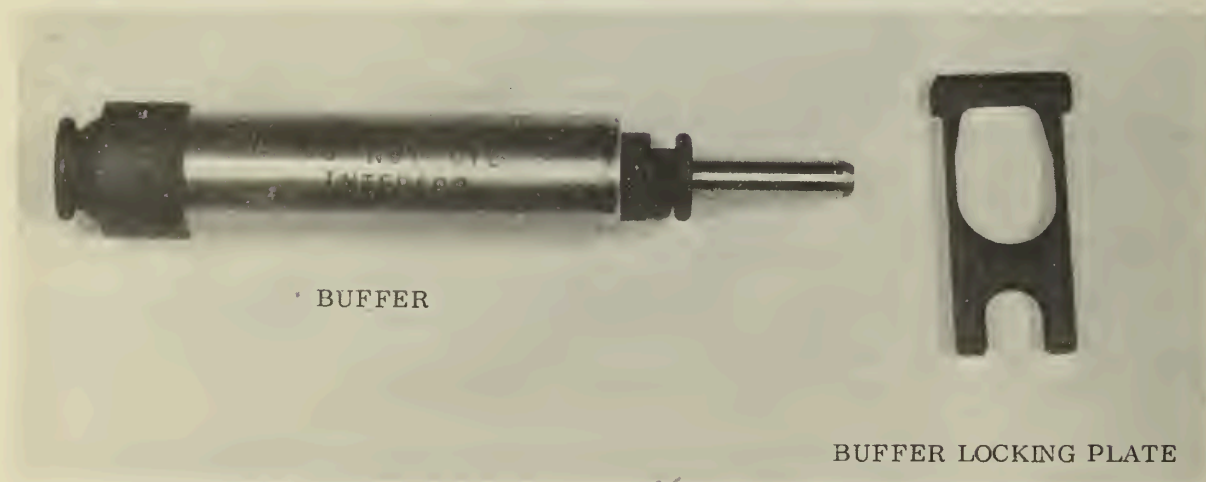


Figure 7. --The Buffer Group.

d. Operating Group

(1) Pull the operating rod drive spring and guide from the receiver and separate them.

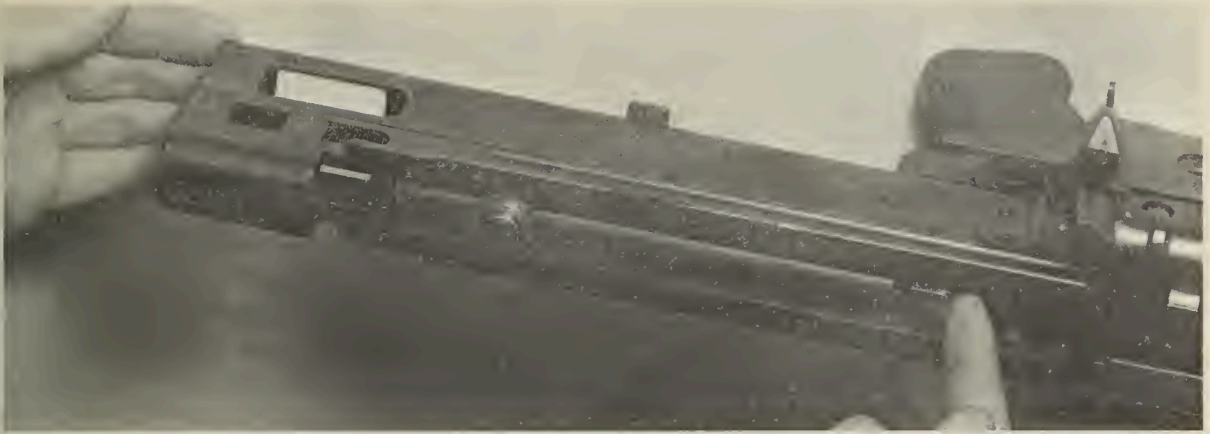


Figure 8. --Pushing the Operating Parts to the Rear.

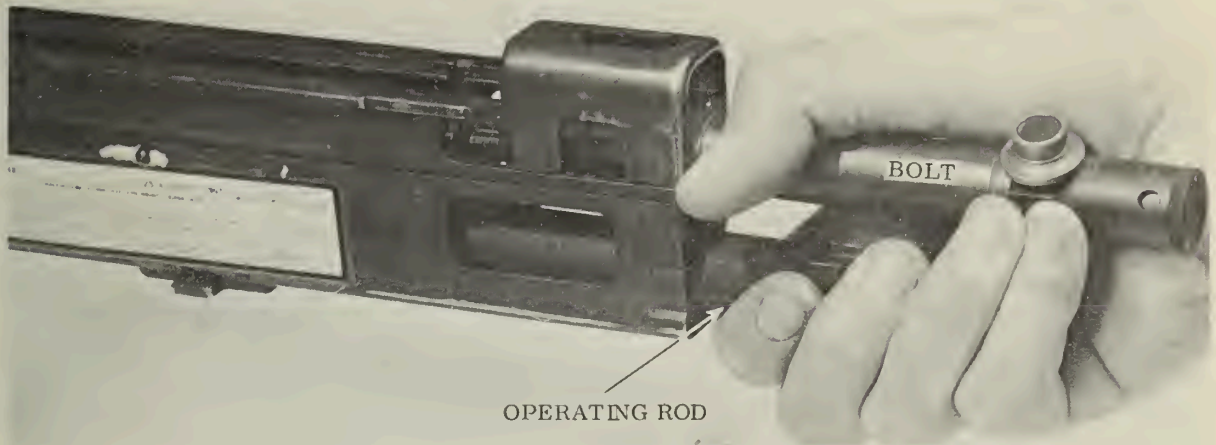


Figure 9. --Removing the Bolt and Operating Rod.

(2) Pull the cocking lever handle to the rear and return it forward. Push rearward on the bolt face until about four inches of the bolt is exposed at the rear of the receiver. (See fig. 8.)

(3) Grasp the operating rod and bolt securely and remove them from the receiver. Slowly relax the grip and allow the bolt to rotate on the operating rod. (See fig. 9.)

(4) The operating group consists of the operating rod drive spring, the operating rod drive spring guide, the operating rod, and the bolt.



Figure 10. --Removing the Spring Lock--Step One.

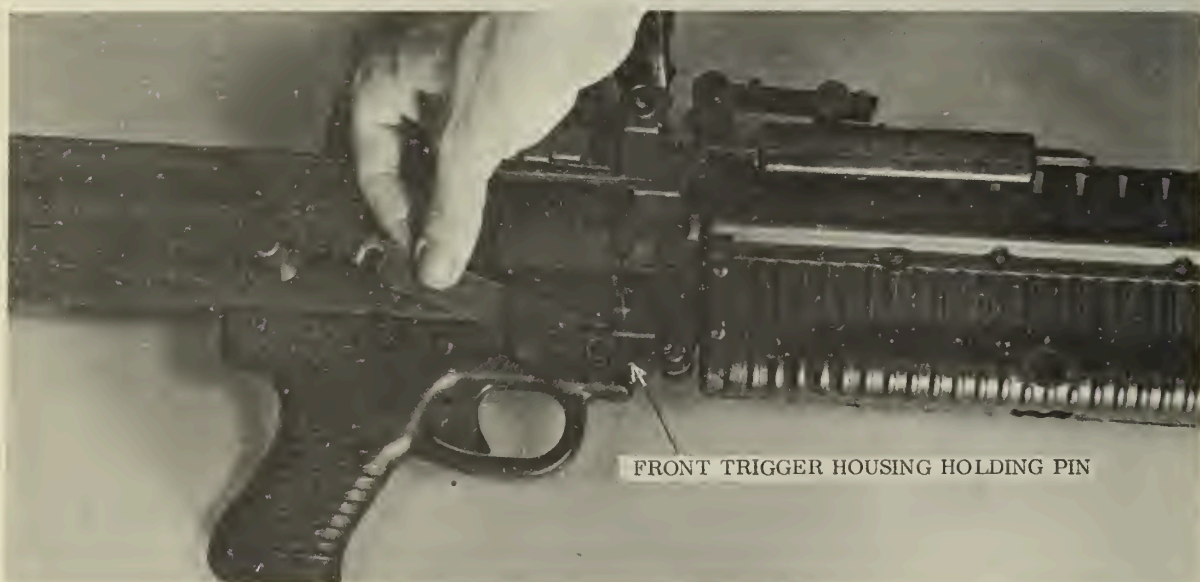


Figure 11. --Removing the Spring Lock--Step Two.

e. Trigger Housing Group

(1) Press in on the rear of the spring lock.

(2) Disengage the spring lock from the rear trigger housing holding pin by rotating it up. (See fig. 10.)

(3) Disengage the spring lock from the front trigger housing holding pin. (See fig. 11.)

(4) Remove the front trigger housing holding pin from right to left. (See fig. 12.)



Figure 12. --Removing the Front Trigger Housing Holding Pin.

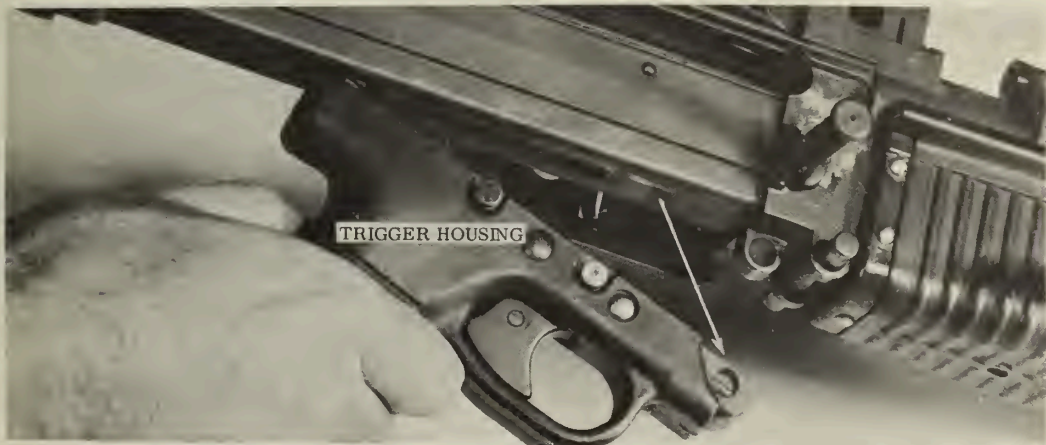


Figure 13. --Removing the Trigger Housing.

(5) Push forward on the trigger housing and remove it by rotating it downward. (See fig. 13.)

(6) The trigger housing group consists of the spring lock, the front trigger housing holding pin, and the trigger housing.

f. Barrel Group

(1) Raise the barrel locking lever to the vertical position. (See fig. 14.)

(2) Grasp the barrel and pull it from the receiver.

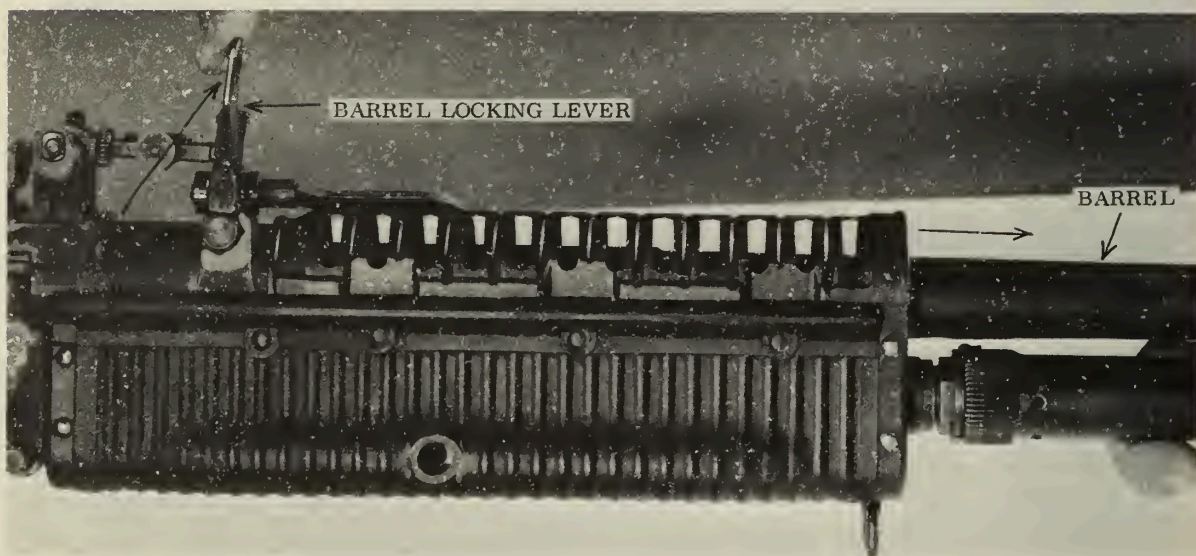


Figure 14. --Removing the Barrel Group.

g. Receiver Group. --The receiver group consists of the receiver, firearm assembly, rear sight, cover, feedplate, and carrying handle. General disassembly of the gun is completed after the removal of the other five groups from the heavier group. (See fig. 15.)

1203. GENERAL ASSEMBLY

General assembly is accomplished by replacing the six major groups in reverse order of their disassembly.



Figure 15. --The Receiver Group.

a. Barrel Group

(1) Raise the barrel locking lever.

(2) Insert the rear of the barrel beneath the barrel cover, ensuring that the gas cylinder nut is aligned with the gas cylinder tube. Push the barrel into the receiver until it is fully seated. (See fig. 16.)

b. Trigger Housing Group

(1) Insert the notched detent on the rear of the trigger housing into its recess in the bottom of the receiver. (See fig. 17.)

(2) Rotate the front of the trigger housing upward and align its holes with those in the trigger housing mounting bracket on the receiver. (See fig. 17.)

(3) Replace the front trigger housing holding pin from left to right.

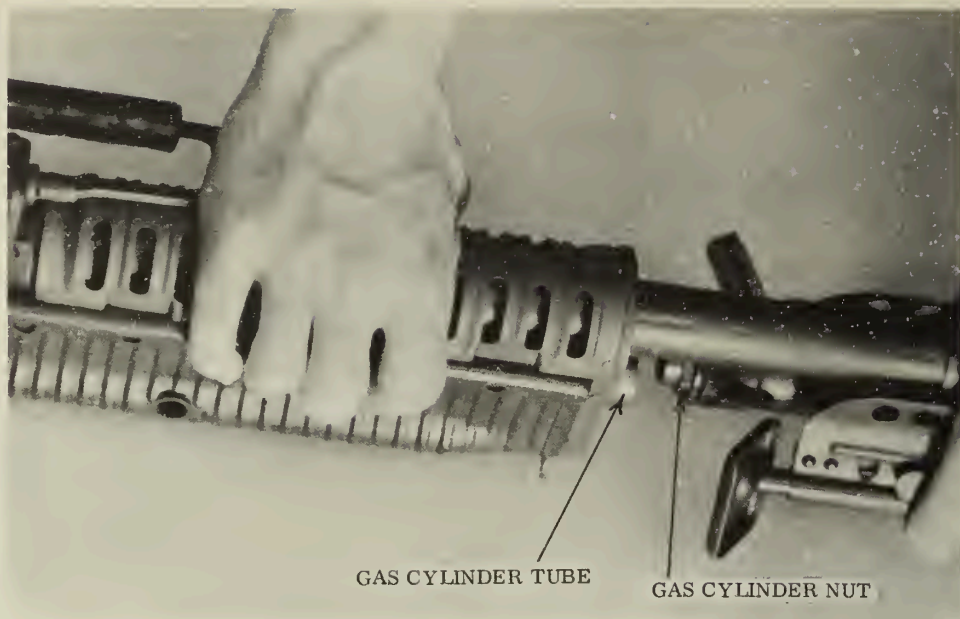


Figure 16. --Replacing the Barrel Group.

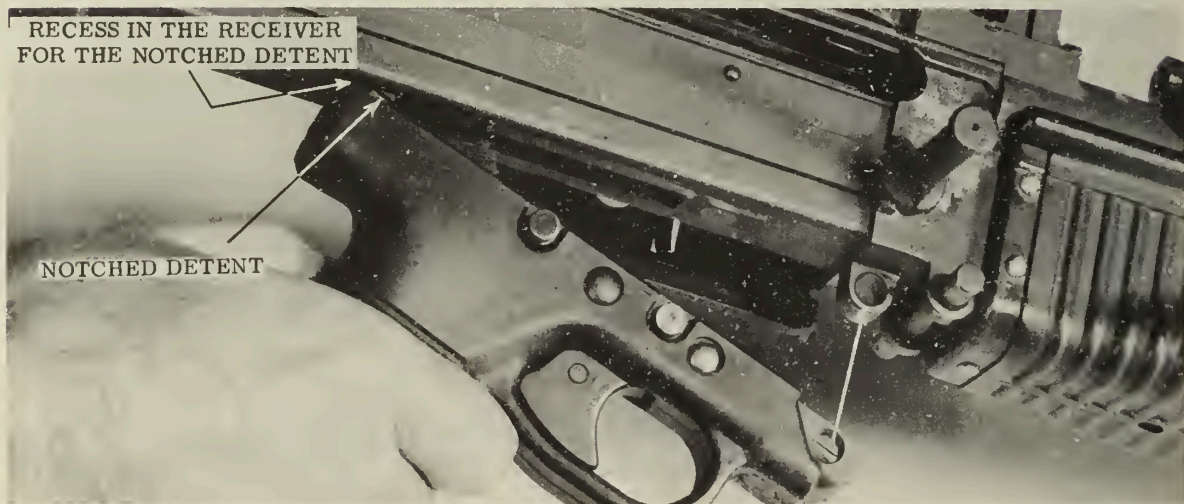


Figure 17. --Replacing the Trigger Housing.

(4) Engage the open end of the spring lock to the front trigger housing holding pin. Rotate the spring lock down and engage the open side to the rear trigger housing holding pin. (See fig. 18.)



Figure 18. --Replacing the Spring Lock.

c. Operating Group

(1) Insert the forward end of the operating rod about six inches into the receiver.

(2) Grasp the operating rod with one hand. Place the palm of the other hand against the rear of the bolt and push forward on the bolt causing it to rotate 1/4 turn counterclockwise. (See fig. 19.)

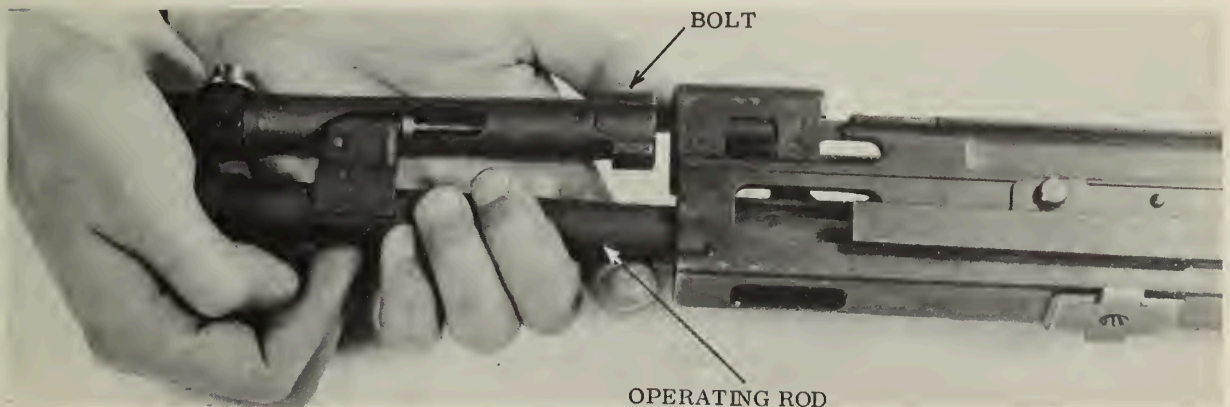


Figure 19. --Rotating the Bolt.

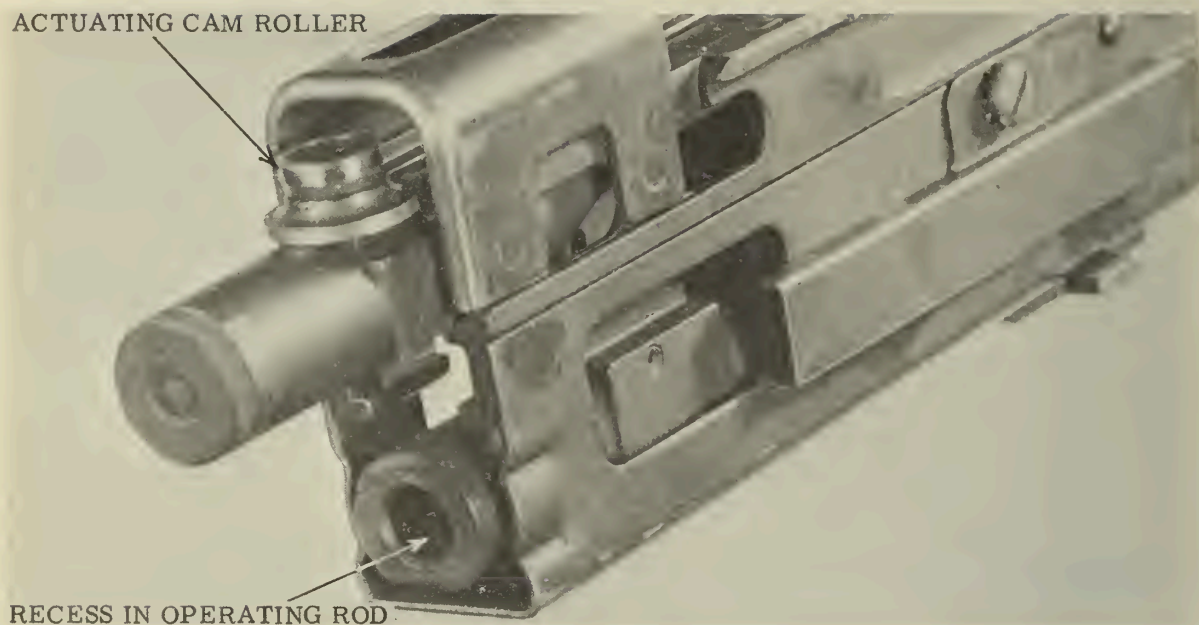


Figure 20. --Replacing the Bolt and Operating Rod.

(3) Align the locking lugs on the bolt with the guide rails on the receiver. Insert the operating rod and bolt into the receiver, ensuring that the actuating cam roller is upright. (See fig. 20.)

(4) Assemble the operating rod drive spring and guide and insert them into the recess in the rear of the operating rod. (See fig. 21.)

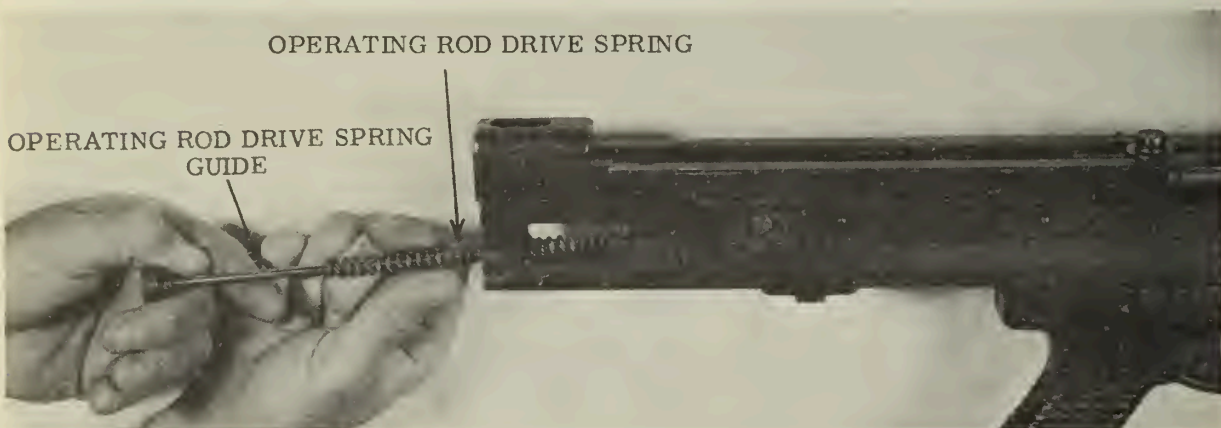


Figure 21. --Replacing the Operating Rod Drive Spring and Guide.

(5) Push forward on the operating rod drive spring guide and pull the trigger, allowing the bolt and operating rod to move fully forward.

d. Buffer Group

(1) Insert the buffer plunger into the recess in the head of the operating rod drive spring guide. (See fig. 22.)

(2) Push forward on the buffer until the buffer locking plate recess in the buffer is aligned with the buffer locking plate recess in the receiver. Replace the buffer locking plate by inserting it into the recesses in the receiver and buffer. (See fig. 23.)

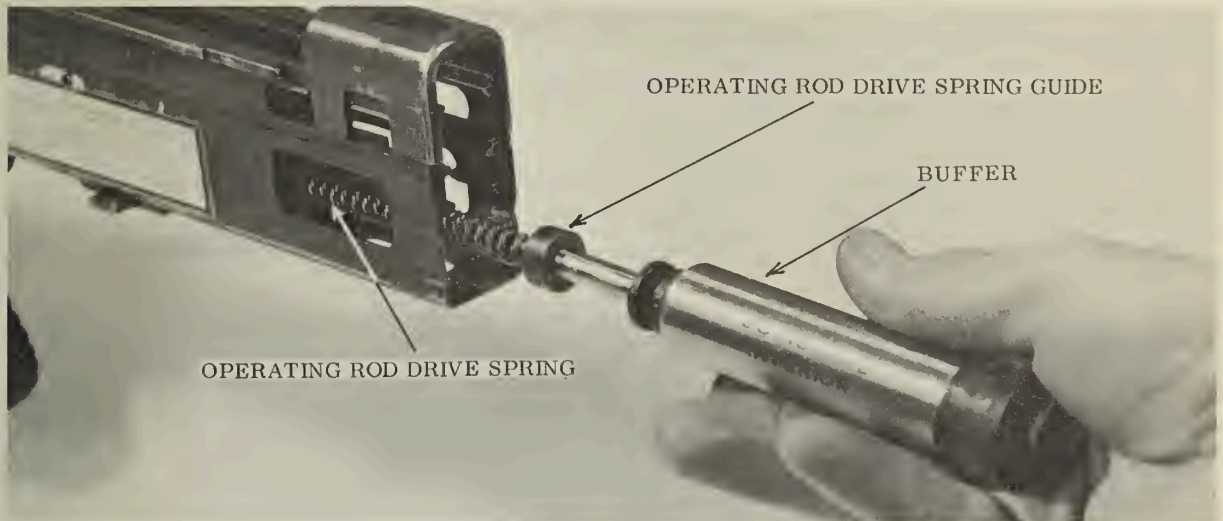


Figure 22. --Replacing the Buffer.

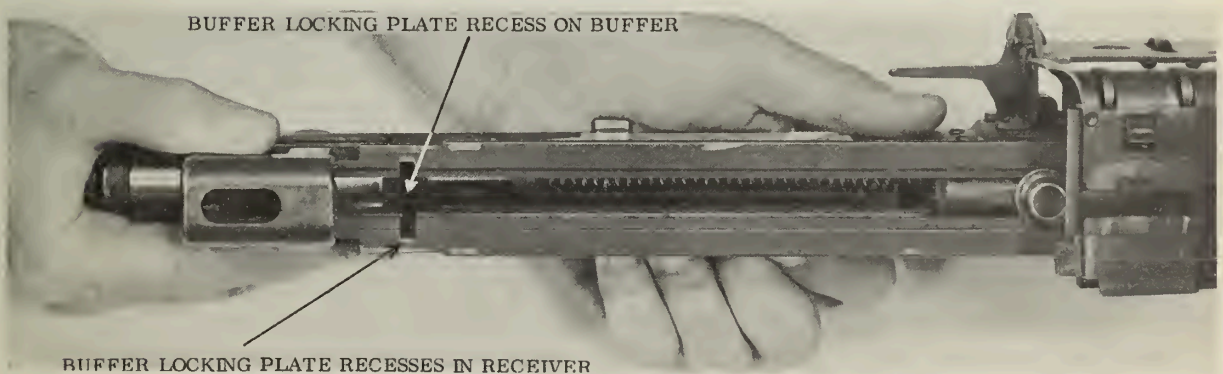


Figure 23. --Replacing the Buffer Locking Plate.

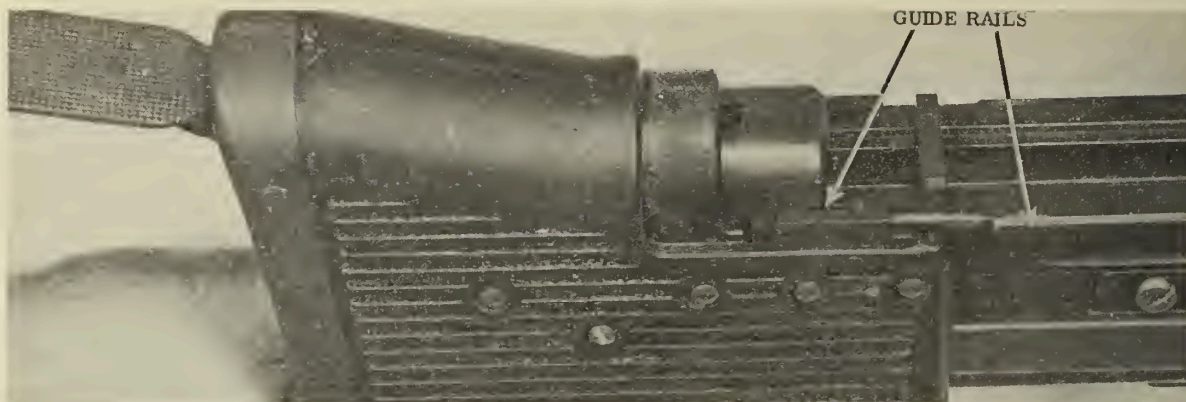


Figure 24. --Replacing the Butt Stock Group.

e. Butt Stock Group

(1) Align the guide rails on the butt stock with the guide rails on the receiver. (See fig. 24.)

(2) Push the butt stock forward until it is fully seated. A distinct click will be heard when the latch engages. The machinegun is now fully assembled.

1204. CORRECT ASSEMBLY

To check for correct assembly, pull the cocking handle to the rear and return it to its forward position. Close the cover and pull the trigger. The bolt should go forward.

1205. DETAILED DISASSEMBLY AND ASSEMBLY

Detailed disassembly and assembly involves removing and replacing the component parts of the major groups. Detailed disassembly of the operating group, trigger housing group, barrel group, and receiver group is authorized at the unit level. Detailed disassembly of the stock group and the buffer group is not authorized.

a. Operating Group

(1) Disassembly

(a) Grasp the operating rod in one hand and the bolt in the other. Push the operating rod toward the rear of the bolt as far as it will



Figure 25. --Separating the Bolt and Operating Rod.

go, then raise the forward end of the operating rod. (See fig. 25.) This will disengage the operating rod yoke from the bolt.

(b) To disassemble the bolt, rotate the actuating cam assembly until the holes are aligned with the bolt plug pin. (See fig. 26.)

(c) Using the point of the operating rod drive spring guide as a tool, push the bolt plug pin out of the bolt. (See fig. 26.)

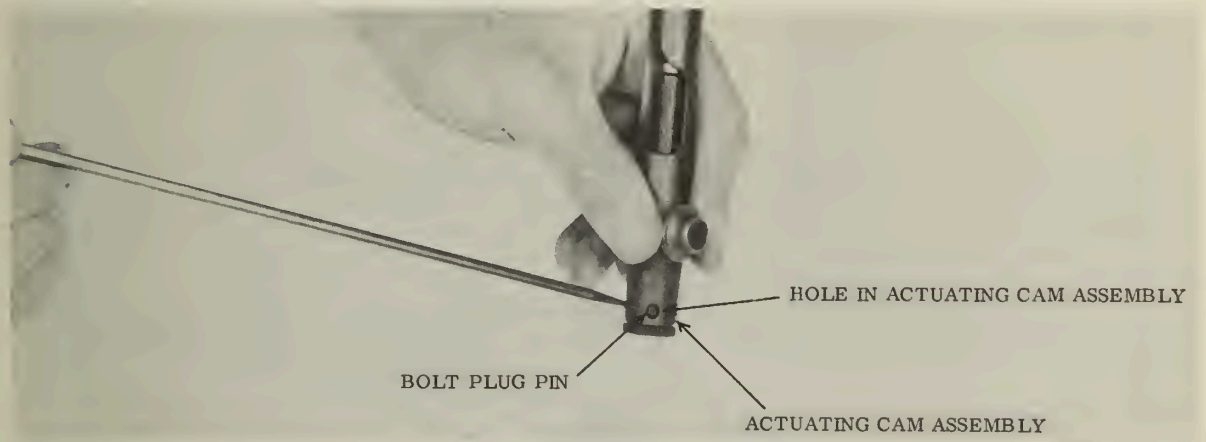


Figure 26. --Removing/Replacing the Bolt Plug Pin.

(d) Unscrew the bolt plug from the bolt. (See fig. 27.)

(e) Remove the actuating cam assembly by pulling it from the rear of the bolt. (See fig. 28.)

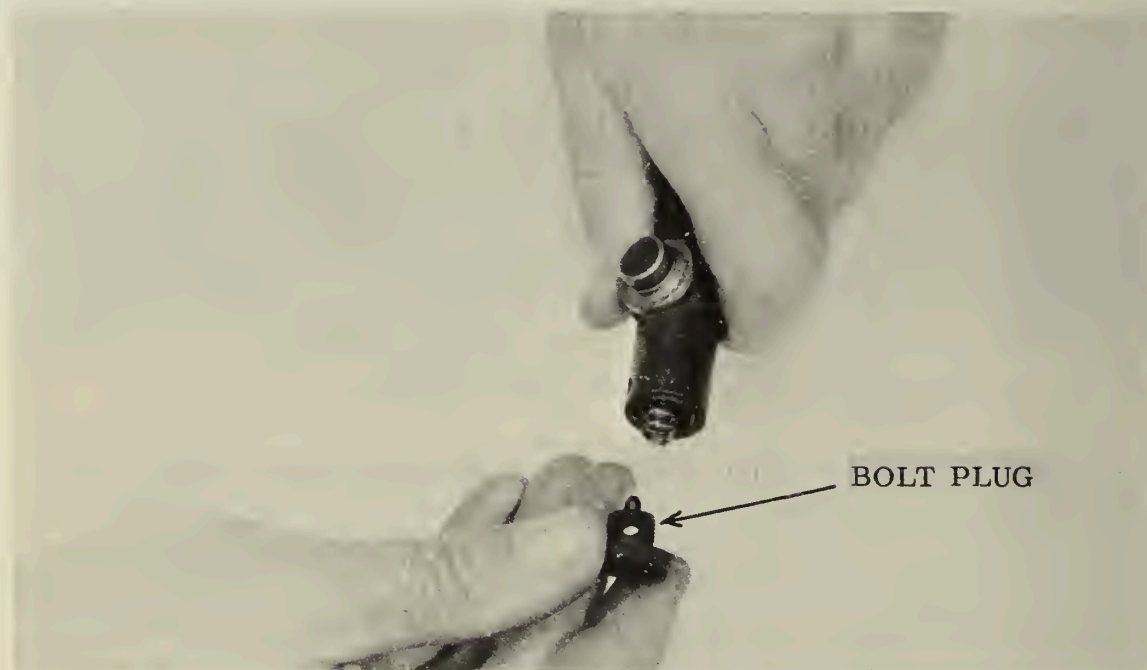


Figure 27. --Removing/Replacing the Bolt Plug.

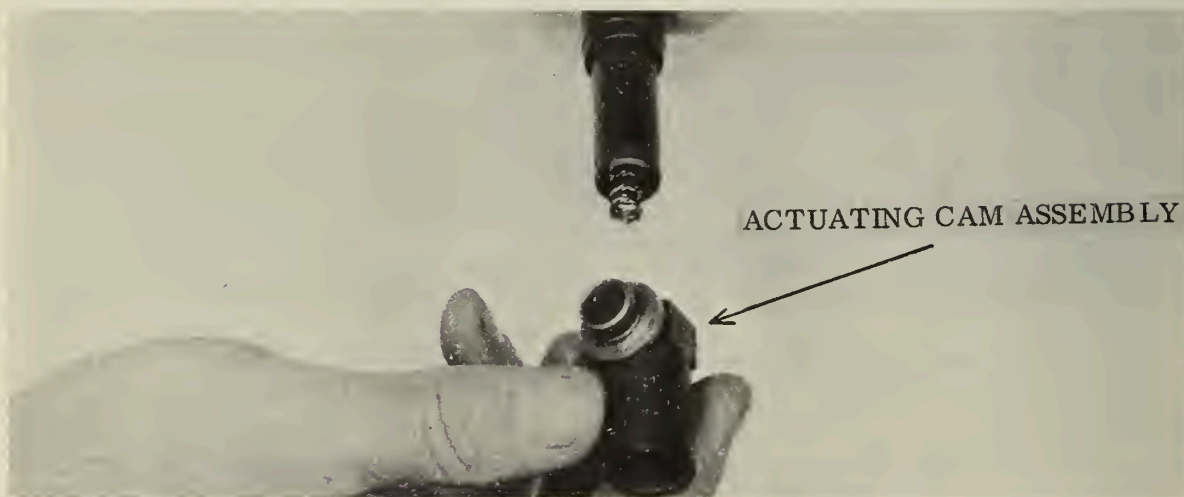


Figure 28. --Removing/Replacing the Actuating Cam Assembly.

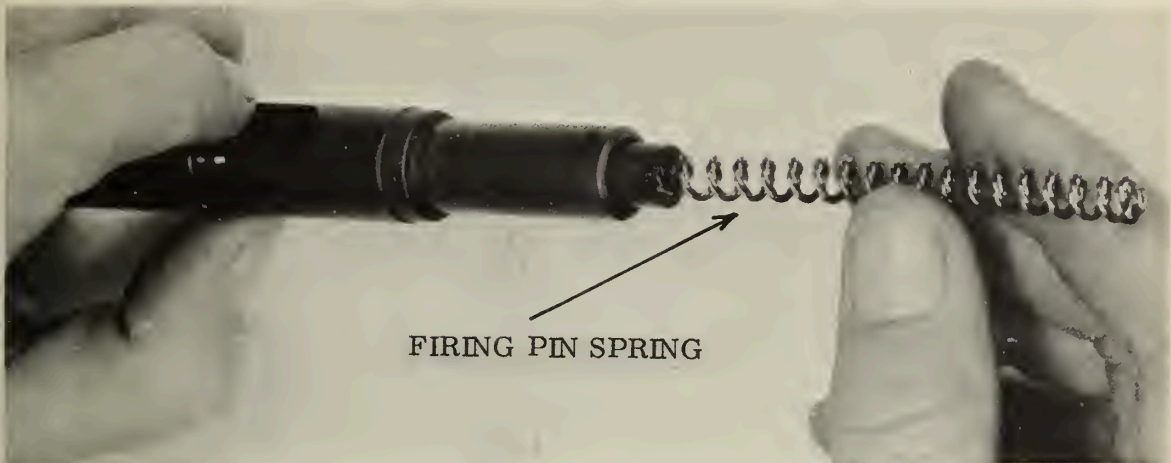


Figure 29. --Removing/Replacing the Firing Pin Spring.



Figure 30. --Removing/Replacing the Firing Pin Bearing.

- (f) Remove the firing pin spring from the rear of the bolt.
(See fig. 29.)
- (g) Remove the firing pin bearing from the rear of the bolt.
(See fig. 30.)

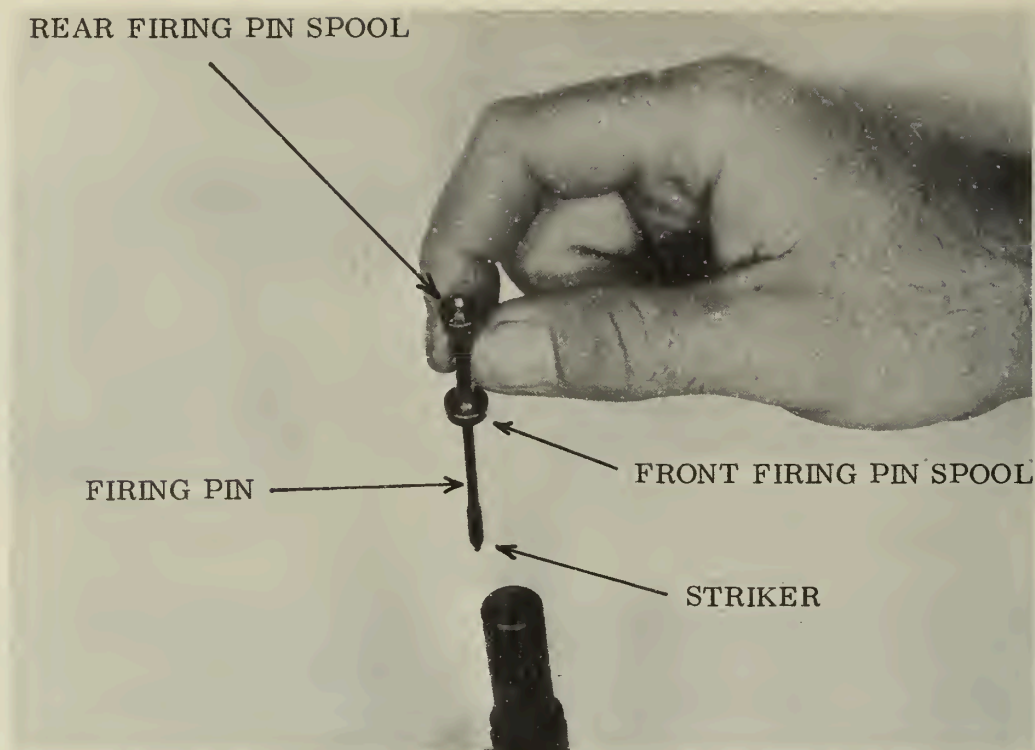


Figure 31. --Removing/Replacing the Firing Pin.

(h) Withdraw the firing pin from the bolt. (See fig. 31.) The extractor and ejector are not removed from the bolt body except by ordnance personnel. (See fig. 32.) The detailed disassembly of the operating group is complete. (See fig. 33.)

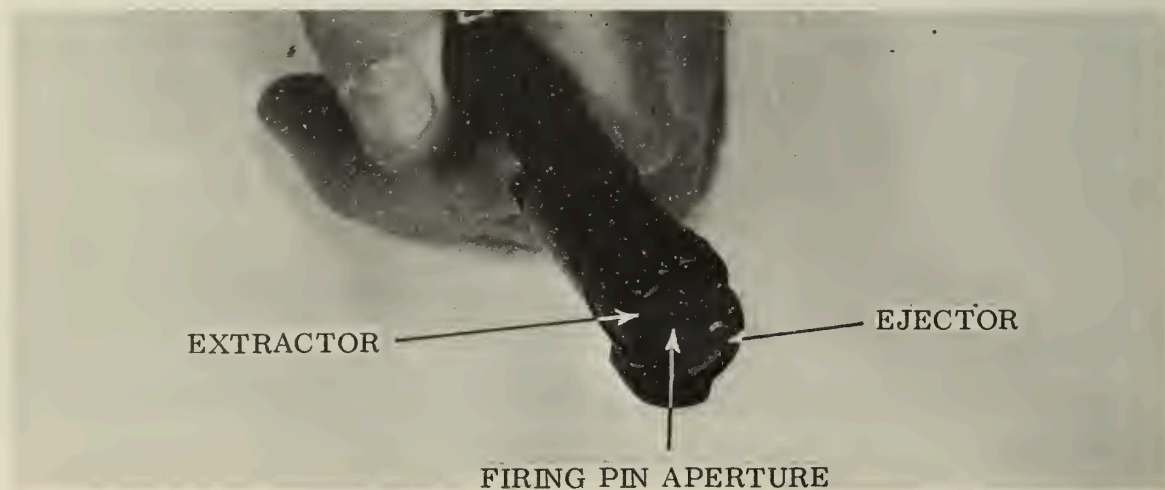


Figure 32. --The Extractor and Ejector Are Removed Only by A Qualified Armorer.

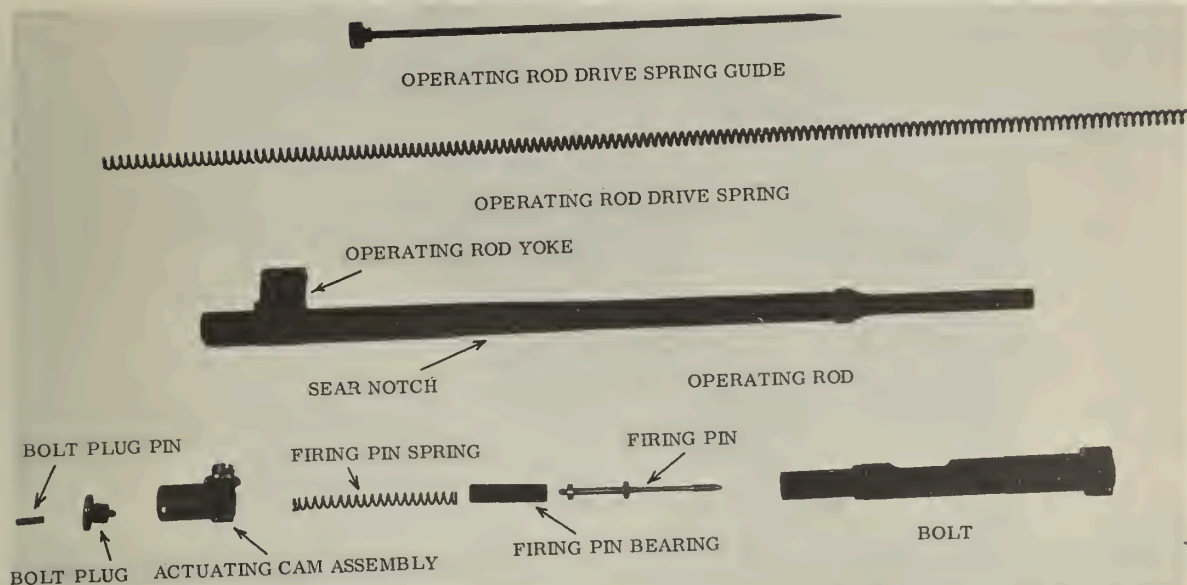


Figure 33. --The Operating Group Disassembled.

(2) Assembly

(a) Insert the firing pin into the bolt with the striker forward. (See fig. 31.)

(b) Replace the firing pin bearing, ensuring that the end with the small hole is forward. (See fig. 30.)

(c) Replace the firing pin spring in the firing pin bearing. (See fig. 29.)

(d) Replace the actuating cam assembly on the bolt with the actuating cam roller forward. (See fig. 28.)

(e) Screw the bolt plug into the bolt body until it is finger tight. (See fig. 27.)

(f) Align the holes in the actuating cam assembly with those in the bolt body. Unscrew the bolt plug slightly until its holes are aligned with the others. Insert the bolt plug pin so that the actuating cam assembly rotates freely around the bolt body. (See fig. 26.)



Figure 34. --Assembling the Bolt and Operating Rod--Step One.



Figure 35. --Assembling the Bolt and Operating Rod--Step Two.

(g) Hold the bolt in one hand and the operating rod in the other. Position the operating rod yoke against the rear firing pin spool and push to the rear compressing the firing pin spring. Rotate the operating rod down until its yoke is in place between the firing pin spools. (See figs. 34 and 35.) The operating group is now assembled.

b. Trigger Housing Group

(1) Disassembly

(a) Press downward on the sear and remove the rear trigger housing holding pin from the left. (See fig. 36.)

(b) Lift the sear from the top of the trigger housing.

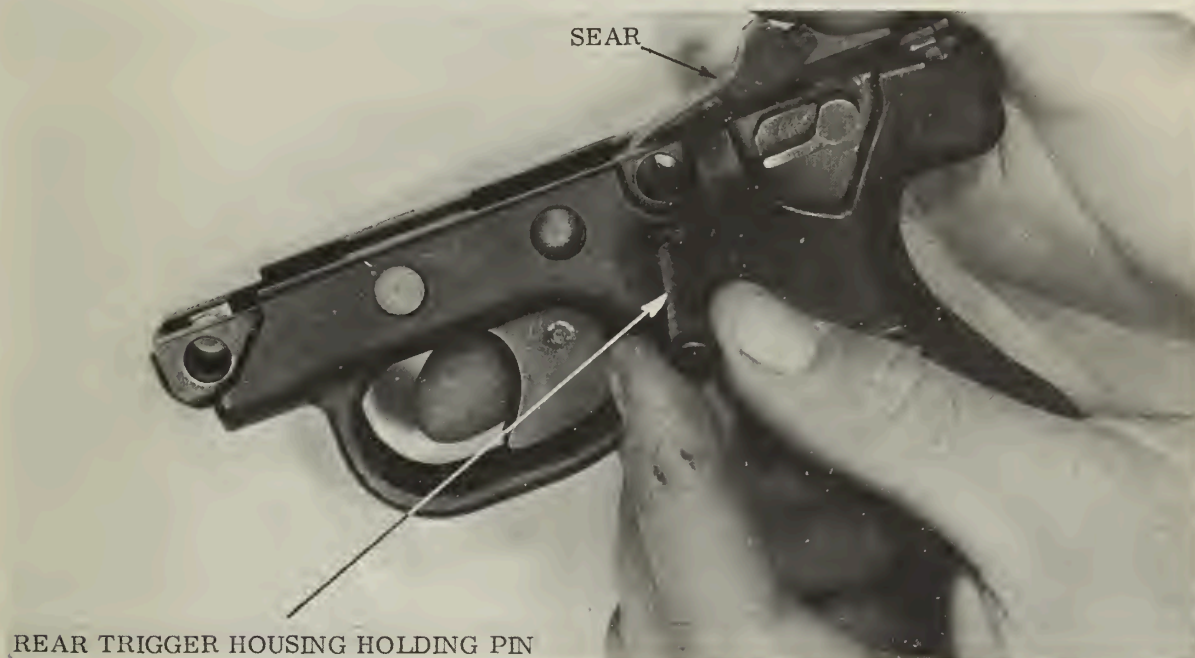


Figure 36. --Removing the Rear Trigger Housing Holding Pin.

- 37.) (c) Remove the sear plunger and sear spring. (See fig. 37.)
- (See fig. 38.) (d) Remove the trigger pin by pushing it to the right.

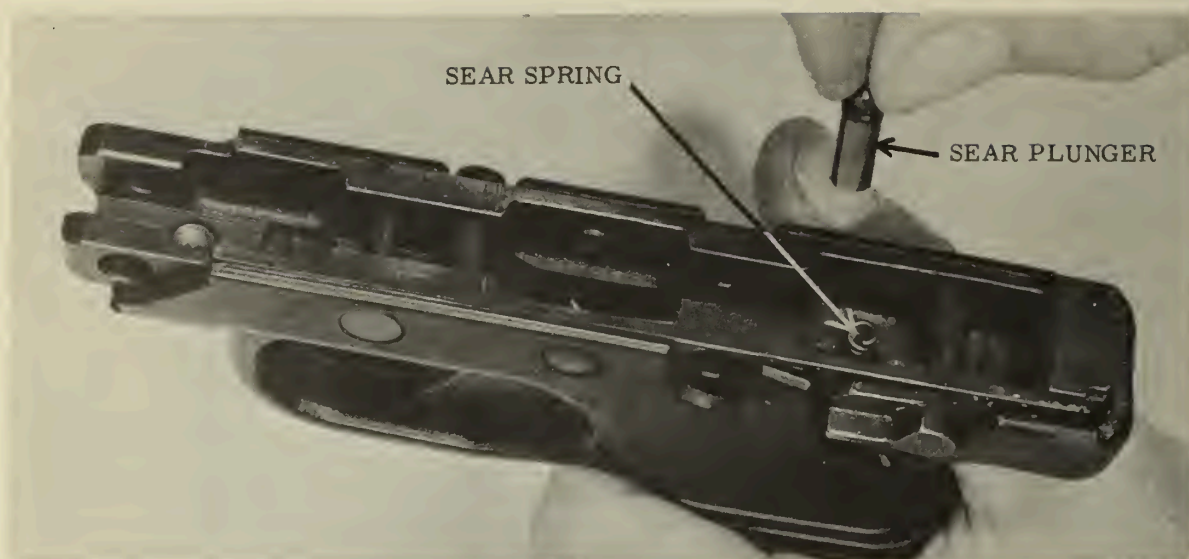


Figure 37. --Removing the Sear Plunger and Sear Spring.

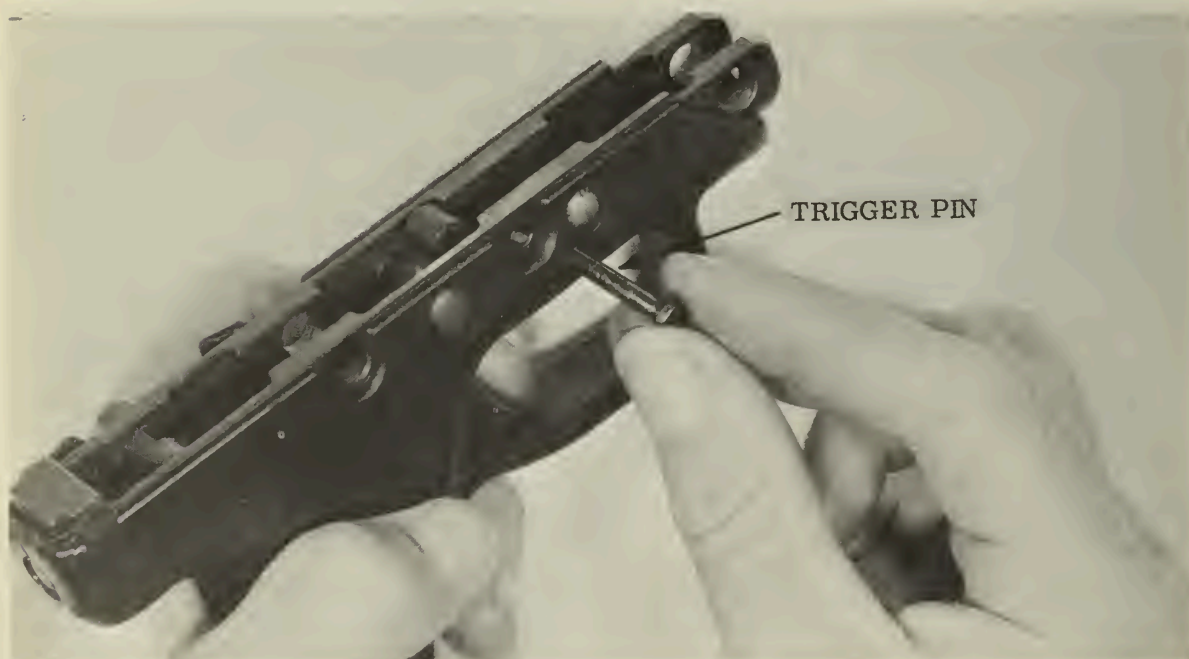


Figure 38. --Removing the Trigger Pin.

(e) Lift the trigger from the top of the trigger housing. (See fig. 39.) The trigger housing group is now disassembled. (See fig. 40.)



Figure 39. --Removing the Trigger.

(2) Assembly

(a) Replace the trigger by positioning it in the trigger guard with the trigger spring under the channel surface. (See fig. 41.)

(b) Align the holes in the trigger with the holes in its housing and insert the trigger pin from the right. Squeeze the trigger to ensure that it is under spring tension.

(c) Replace the sear spring in its hole in the channel surface.

(d) Replace the sear plunger over the sear spring.

(e) Replace the sear with its shoulder up and to the rear. (See fig. 42.)

(f) The front and rear trigger housing holding pins are interchangeable. Insert the rear trigger housing holding pin through its holes in the trigger housing and the sear from left to right. The trigger housing group is now assembled.



Figure 40. --Trigger Housing Group Disassembled.

c. Barrel Group

(1) Disassembly

- (a) Using the combination wrench, unscrew and remove the gas cylinder nut.
- (b) Unscrew and remove the gas cylinder extension in the same manner.
- (c) Slide the gas piston out of the gas cylinder.

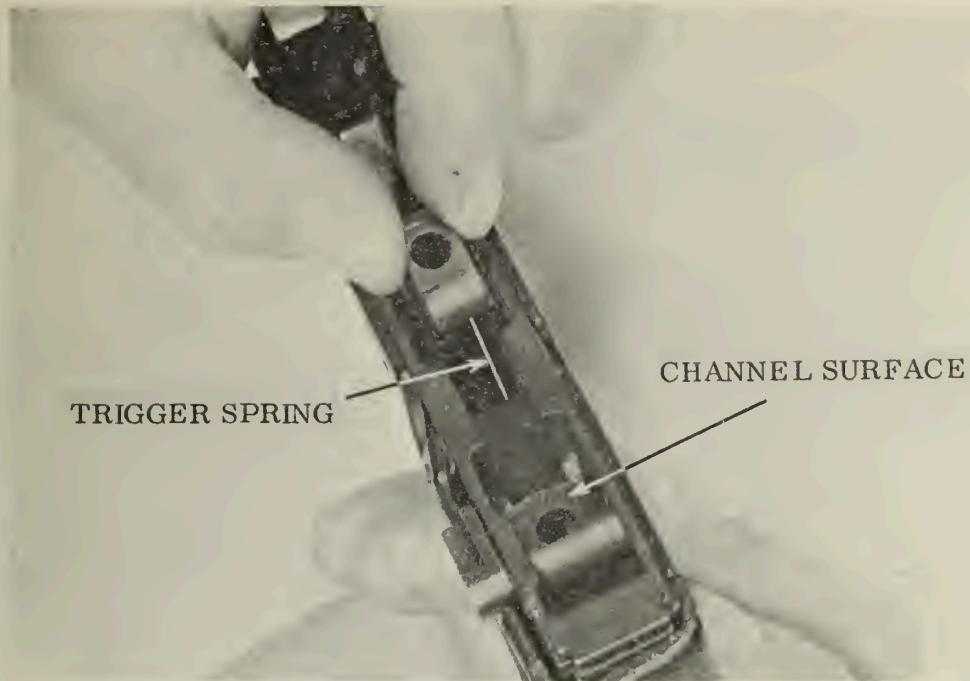


Figure 41. --Replacing the Trigger.

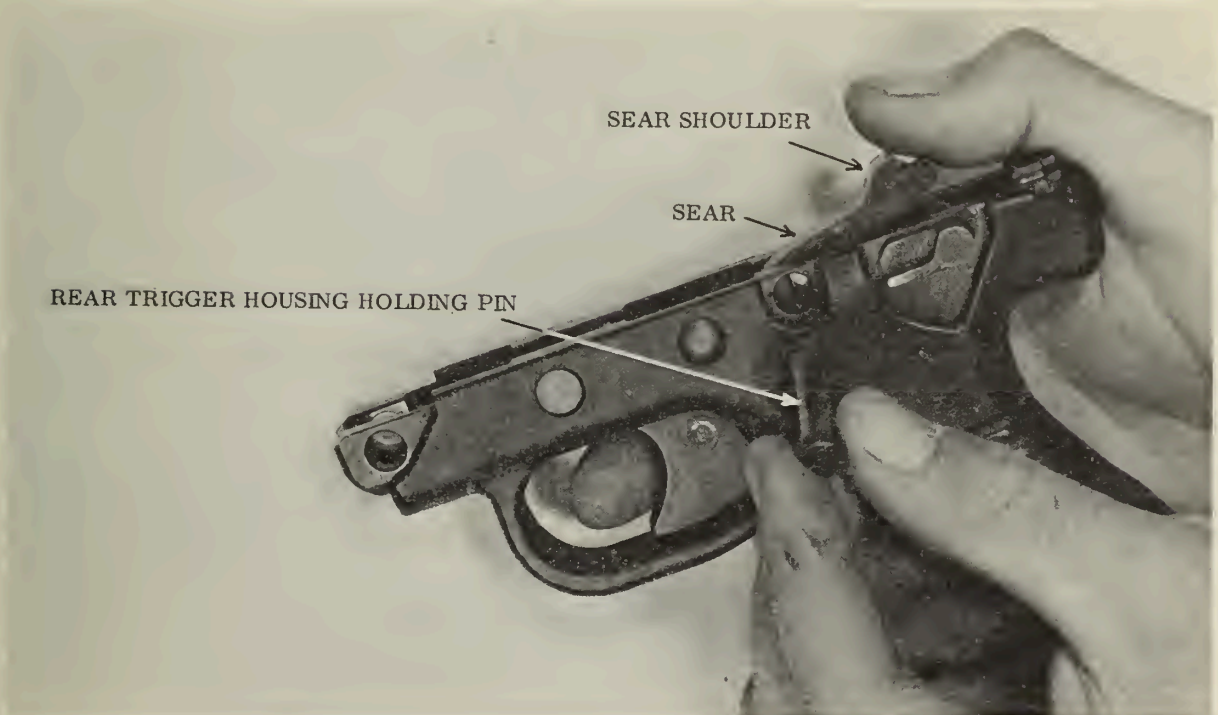


Figure 42. --Replacing the Sear.

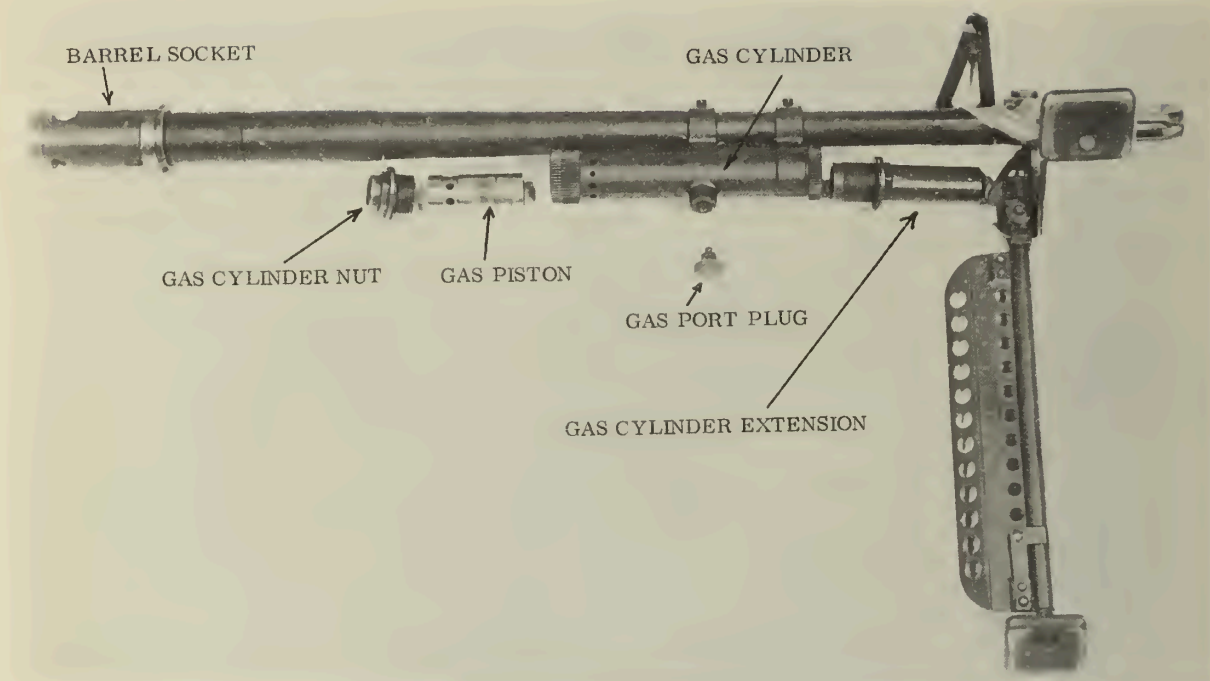


Figure 43. --Barrel Group Disassembled.

(d) Using the closed end of the combination wrench, unscrew and remove the gas port plug. (This is NOT done in normal disassembly if a safety wire is present.) The gas cylinder cannot be removed. The flash suppressor, bipod assembly, and front sight are removed by ordnance personnel only. The barrel group is now disassembled. (See fig. 43.)

(2) Assembly

(a) Replace the gas piston in the gas cylinder, ensuring that the open end is forward.

(b) Using the combination wrench, replace and tighten the gas port plug, gas cylinder extension, and gas cylinder nut. The barrel group is now assembled.

d. Receiver Group

(1) Disassembly

(a) Place the nose of a dummy cartridge in the latch hole of the forearm assembly. (See fig. 44.) Depress the latch and remove the forearm assembly. (See fig. 45.)

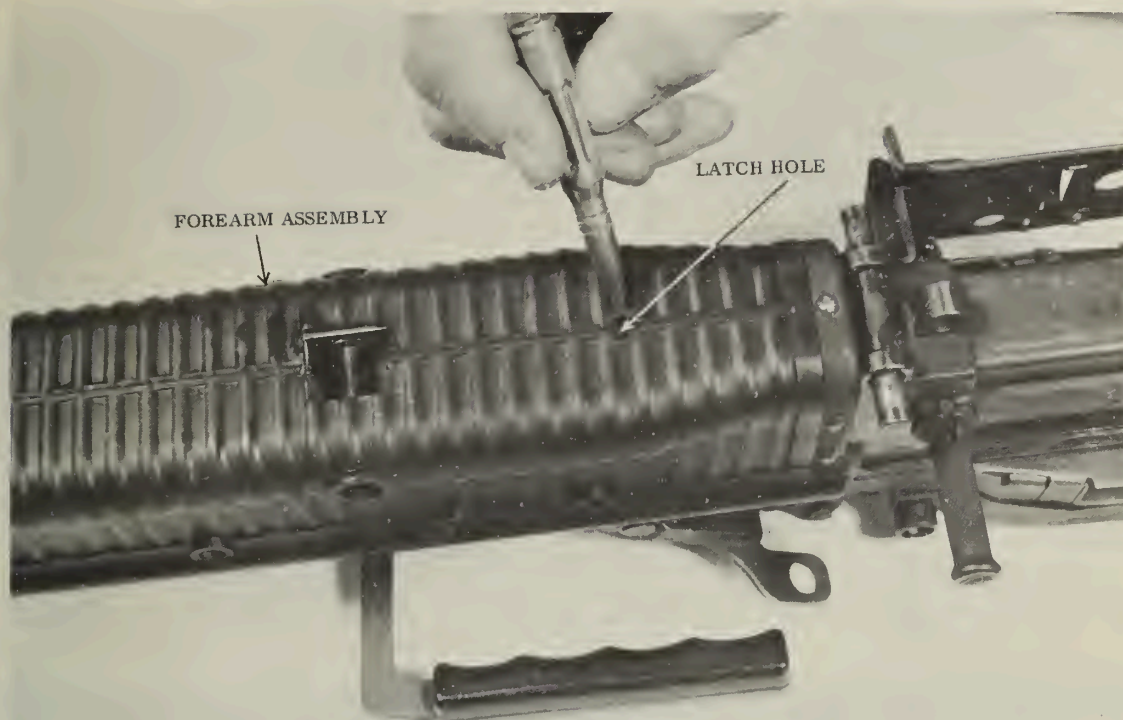


Figure 44. --Removing the Forearm Assembly--Step One.

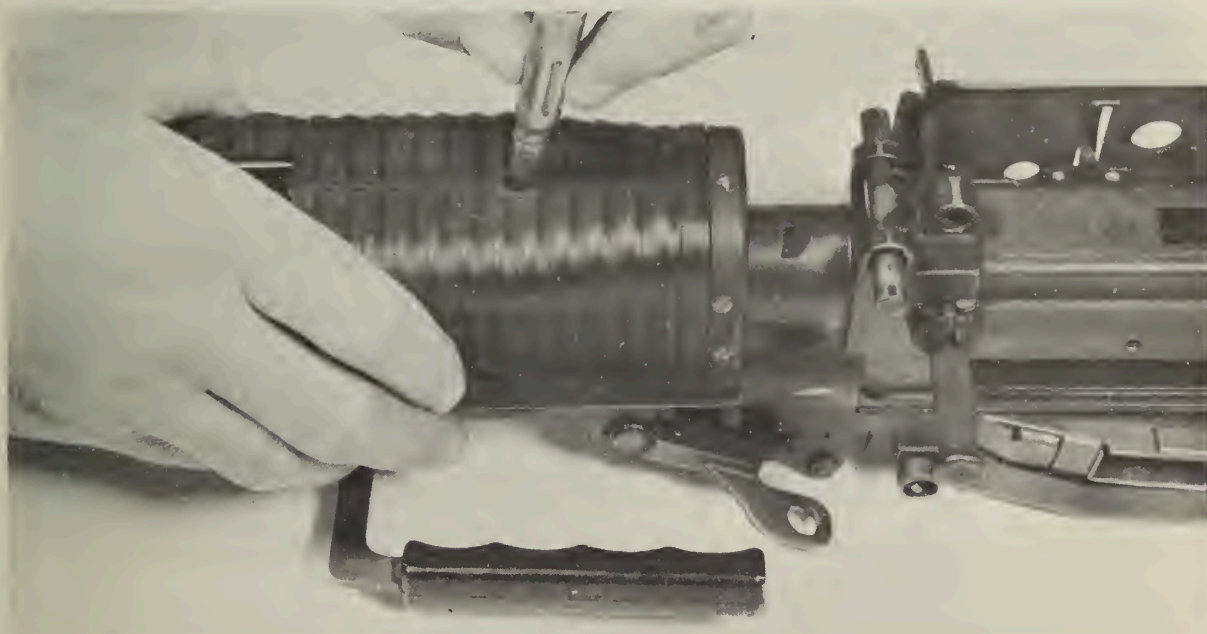


Figure 45. --Removing the Forearm Assembly--Step Two.

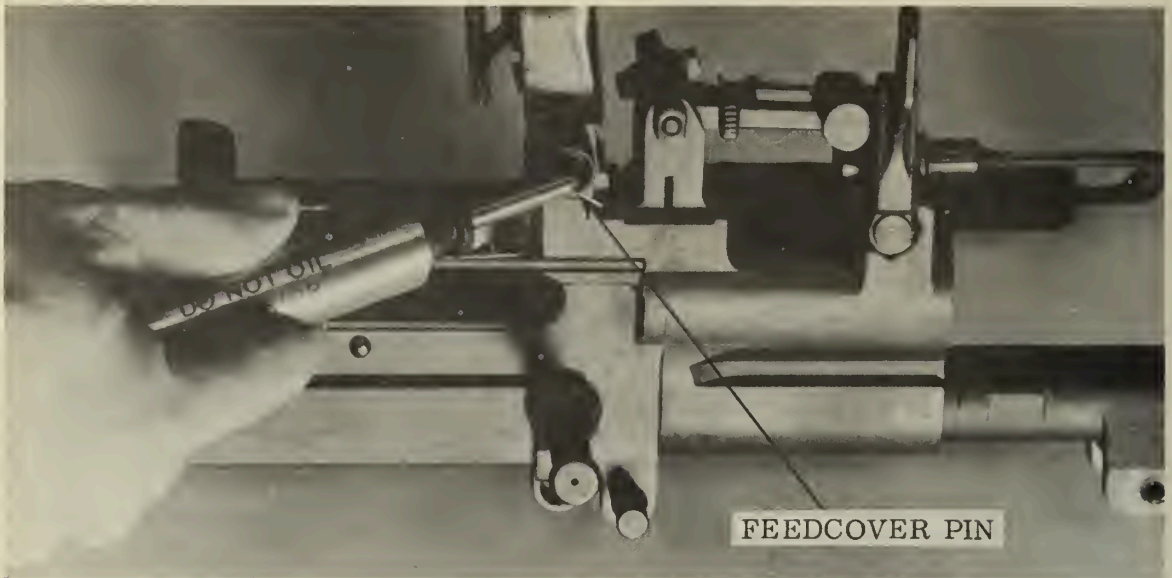


Figure 46. --Removing the Feedcover Pin.



Figure 47. --Removing the Feedcover Sleeve.

(b) Using the buffer as a tool, place the buffer plunger against the tip of the feedcover pin, press in, and remove the feedcover pin. (See fig. 46.) Remove the feedcover sleeve from the opposite side. (See fig. 47.)

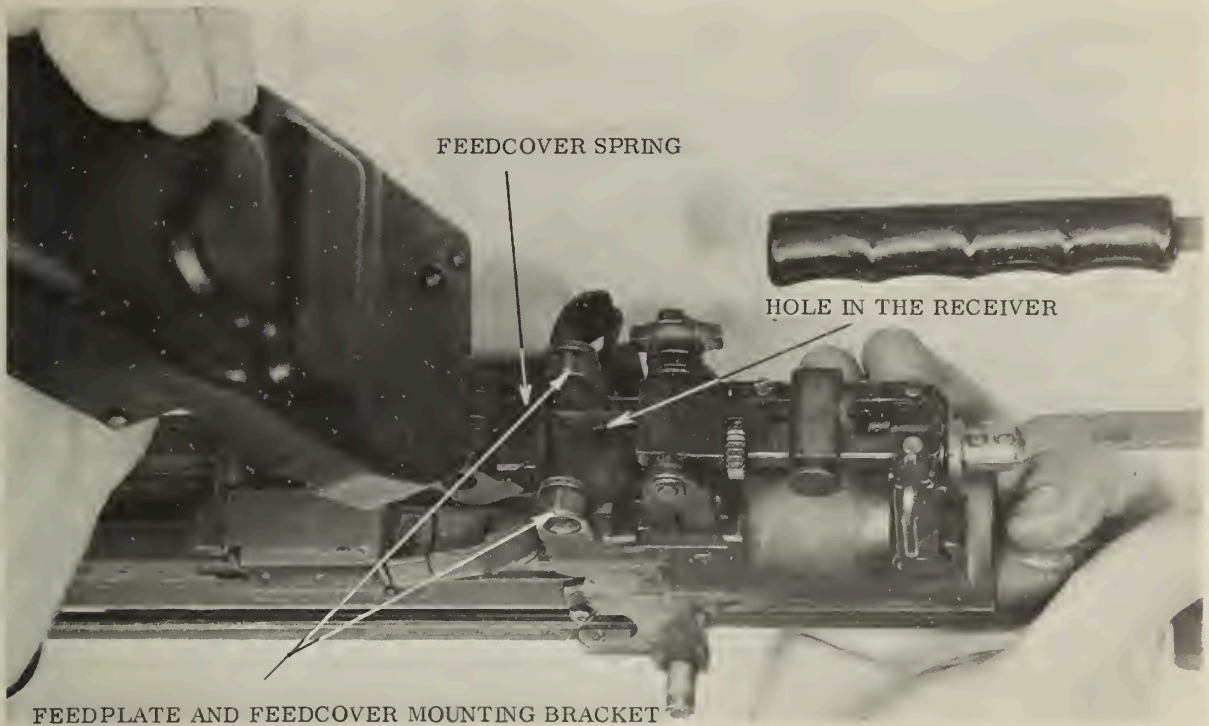


Figure 48. --Removing the Feedcover.

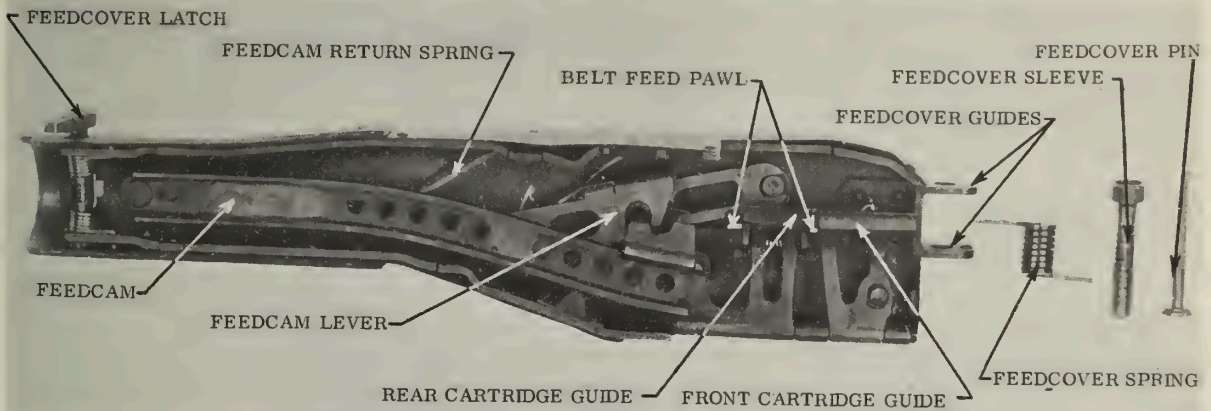


Figure 49. --Nomenclature of the Feedcover.

(c) Grasp the feedcover assembly and lift it from the receiver. (See fig. 48.) The nomenclature of the feedcover is shown in figure 49.

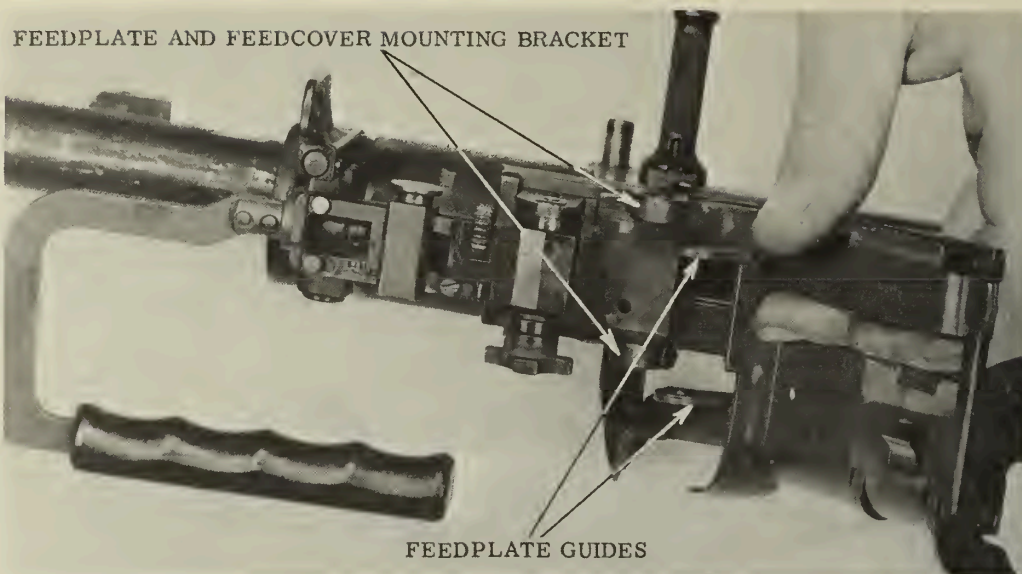


Figure 50. --Removing the Feedplate.

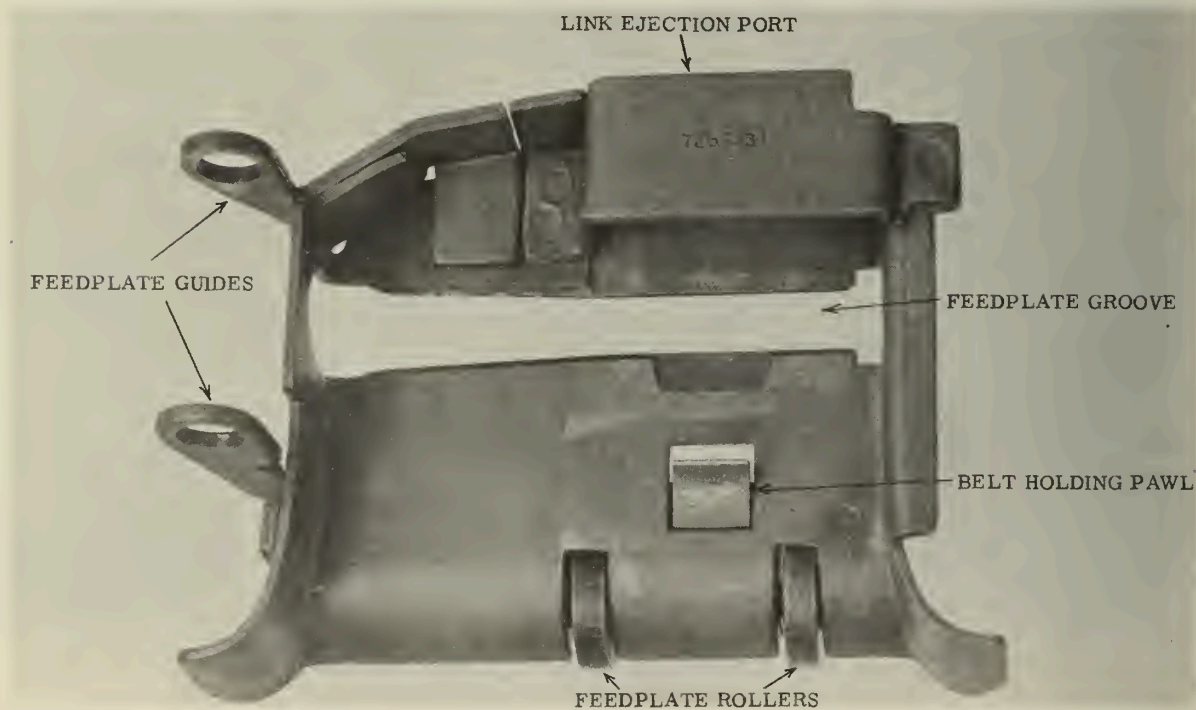


Figure 51. --The Feedplate.

(d) Lift the feedplate assembly from the receiver. (See fig. 50.) The nomenclature of the feedplate is shown in figure 51.

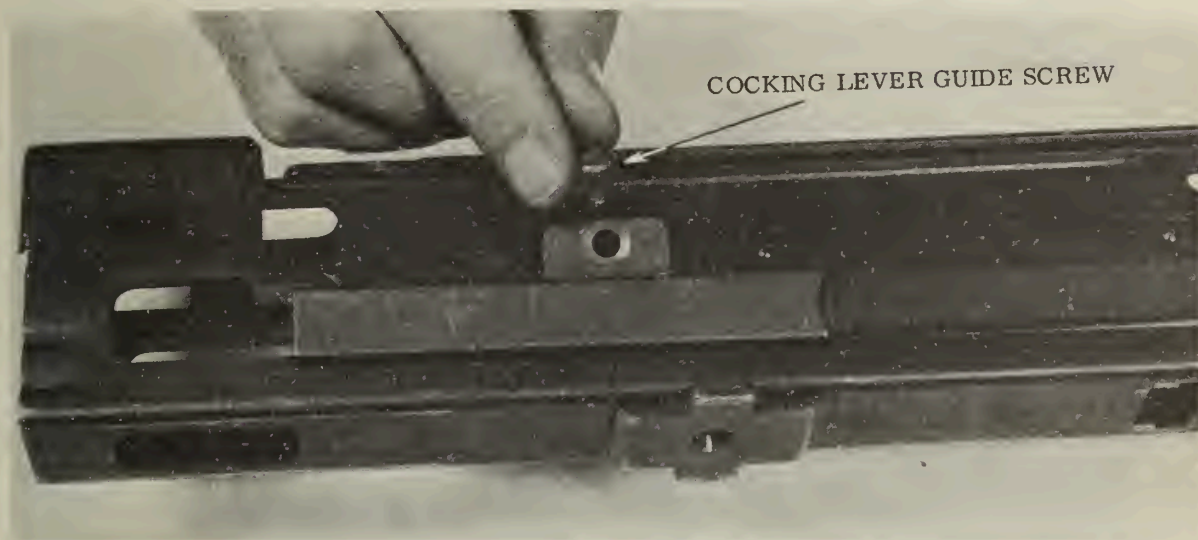


Figure 52. --Removing the Cocking Lever Guide Screw.

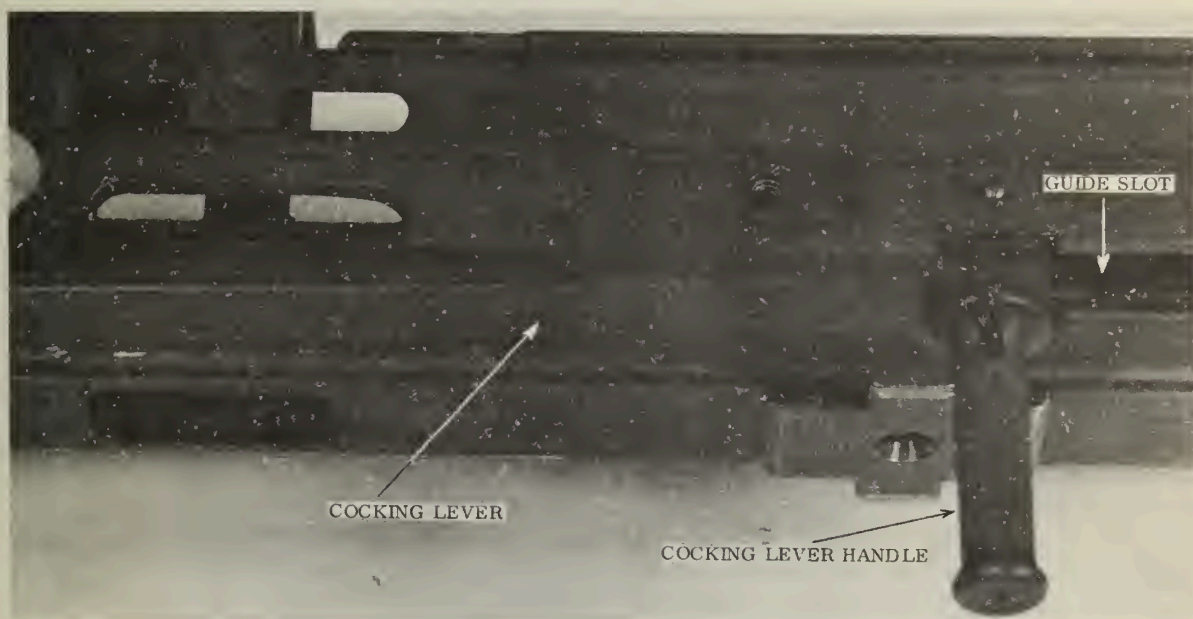


Figure 53. --Removing the Cocking Lever.

(e) Using the screwdriver portion of the combination wrench, unscrew and remove the cocking lever guide screw. (See fig. 52.)

(f) Lift the cocking lever guide from the receiver. Pull the cocking lever all the way to the rear and remove it from the receiver. (See fig. 53.)

(g) The rear sight is shown in figure 54. The rear sight, carrying handle, and barrel locking lever are removed by ordnance personnel only. The receiver group is now disassembled. (See figs. 55, 56, and 57.)

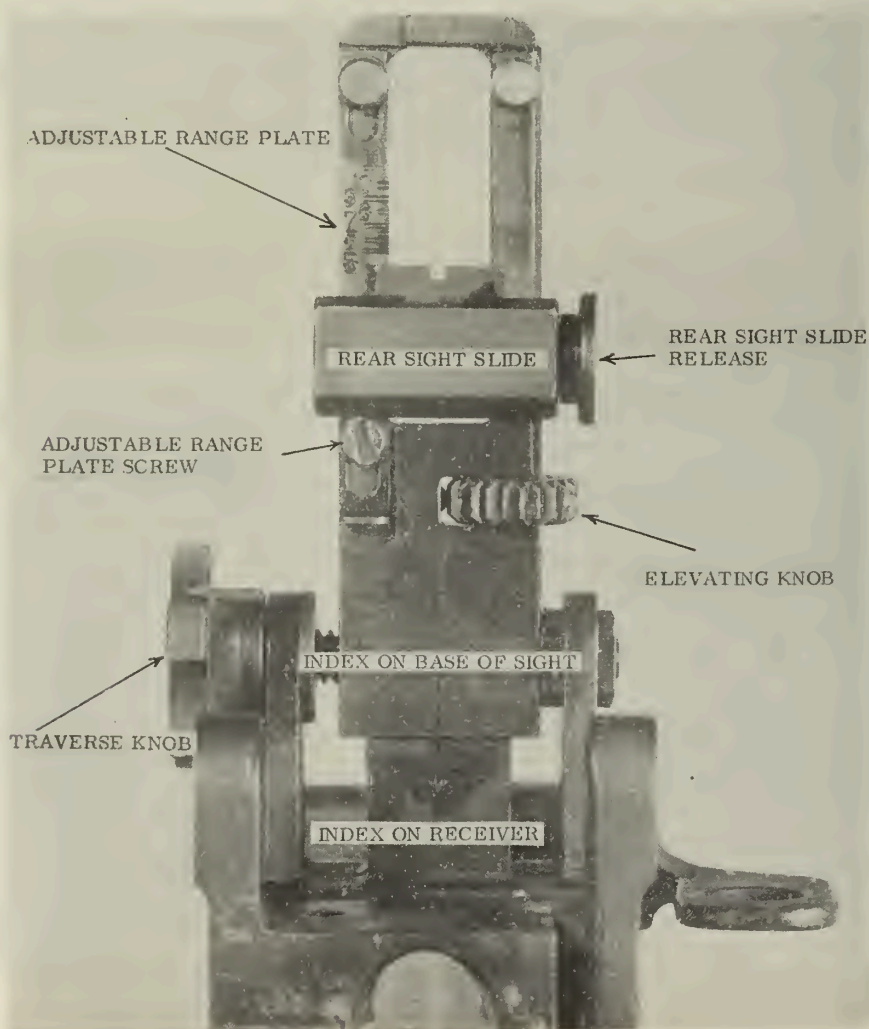


Figure 54. --The Rear Sight.

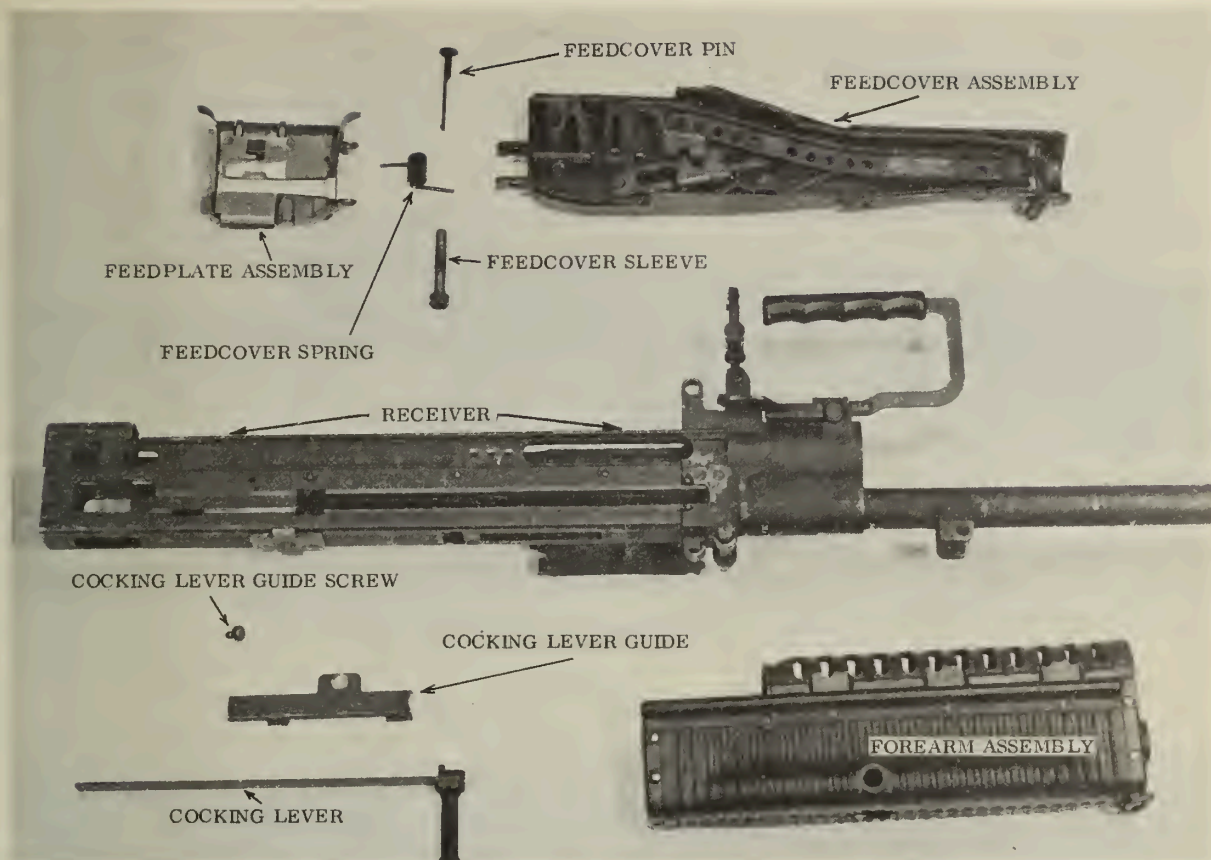


Figure 55. --The Receiver Group Disassembled.

(2) Assembly

- (a) Place the stud of the cocking lever in the large opening of the guide slot. Push the cocking lever forward.
- (b) Position the cocking lever guide over the cocking lever, ensuring that the flanges on the bottom of the guide are placed in their recesses in the receiver.
- (c) Replace and tighten the cocking lever guide screw.
- (d) Align the feedplate guides to the left of the feedplate and feedcover mounting bracket on the receiver. Position the feedcover spring in the hole in the receiver and align the feedcover guides with the feedplate and feedcover mounting bracket.

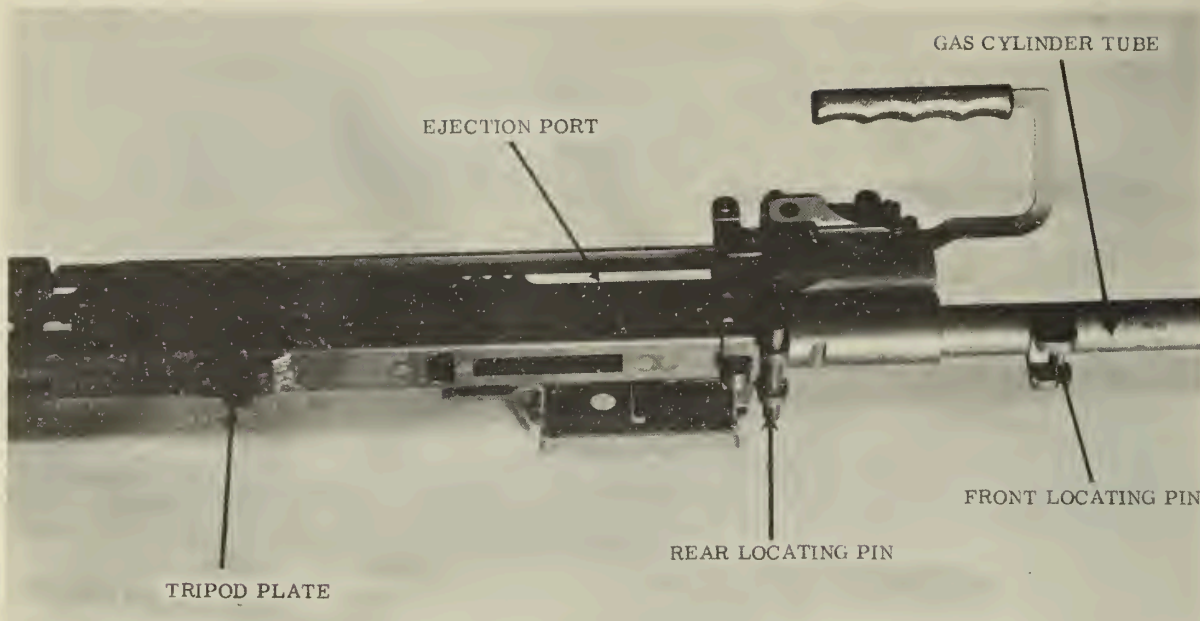


Figure 56. --The Receiver, Right Side and Bottom.

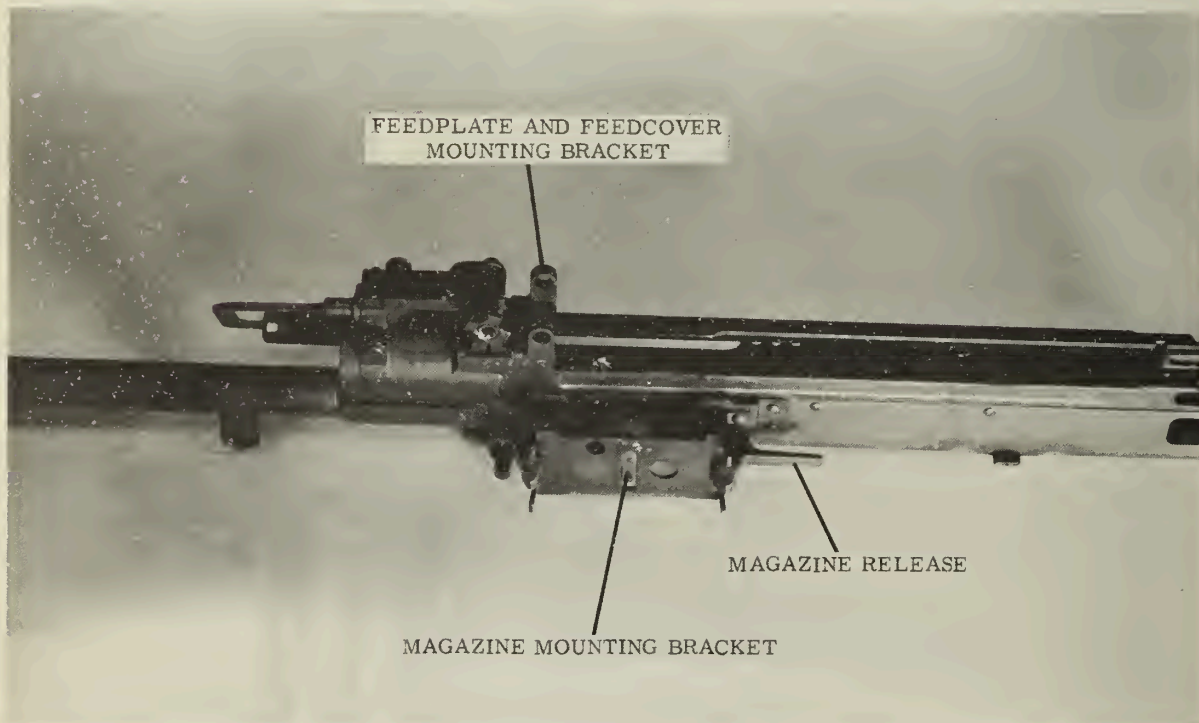


Figure 57. --The Receiver, Left Side and Top.

(e) Insert the feedcover sleeve from one side and the feed-cover pin from the opposite side.

(f) Position the forearm assembly over the gas cylinder tube. Align the end of the gas cylinder tube with the recess in the forearm assembly. Tap the rear of the forearm assembly firmly to seat and lock it in position. The receiver group is now assembled.

Section III. OPERATION AND FUNCTIONING

1301. OPERATION

a. Loading. --The M60 is loaded using one of the following methods:

(1) Feedcover Raised. --To load with the feedcover raised, the bolt must be to the rear and the safety lever on safe. The team leader takes a belt of ammunition and places the first round in the feedplate groove with the open side of the link down. The gunner closes the feedcover and the team leader places the safety on fire. The gun is loaded and ready to fire.

(2) Feedcover Closed. --To load with the feedcover closed, the bolt must be forward and the safety on fire. The team leader takes a belt of ammunition, ensuring that the open side of the link is down. He forces the first round into the feedway until he hears a distinct click. This indicates that the first round has passed to the right of the belt feed pawl and the belt holding pawl. The gunner pulls the bolt to the rear. The gun is loaded and ready to fire.

b. Unloading. --To unload, the gunner raises the feedcover and the team leader clears the feedplate of ammunition and links. The gunner inspects the chamber, closes the feedcover, and pulls the trigger. The team leader places the weapon on safe.

c. Clear Gun. --After the gunner inspects the chamber, the team leader runs a cleaning rod through the bore of the weapon until the gunner can see the tip in the receiver. The cleaning rod is removed. The gunner pulls the trigger, and the team leader places the safety on safe. An additional step for range firing is to raise the feedcover after the bolt has been allowed to go forward. A gun with the bolt forward, the safety lever on safe, and the feedcover up is considered safe.

d. Barrel Change. --To change barrels, the gunner pulls the cocking lever handle to the rear and returns it forward, ensuring that the bolt is to the rear. The team leader places the weapon on safe. The gunner raises the barrel locking lever with his right hand, and keeps his hand on the barrel locking lever throughout the change. The team leader, wearing the asbestos mitten, removes the barrel and replaces it with the

spare barrel. The gunner lowers the barrel locking lever, the team leader places the weapon on fire, and the gun team continues the mission. Care should be taken to prevent contact of a hot barrel with the spare barrel case.

1302. FUNCTIONING

The machinegunner must know how the gun functions so that he is able to correct malfunctions and reduce stoppages. The cycle of functioning is broken down into eight steps. However, the entire cycle takes place in approximately 1/10 of a second and certain steps overlap.

a. Feeding.--The first step in the cycle of functioning is feeding. When loading with the feedcover closed and the bolt forward, feeding begins when the team leader positions the first round to the right of the belt holding pawl. At this time, the belt holding pawl and the belt feed

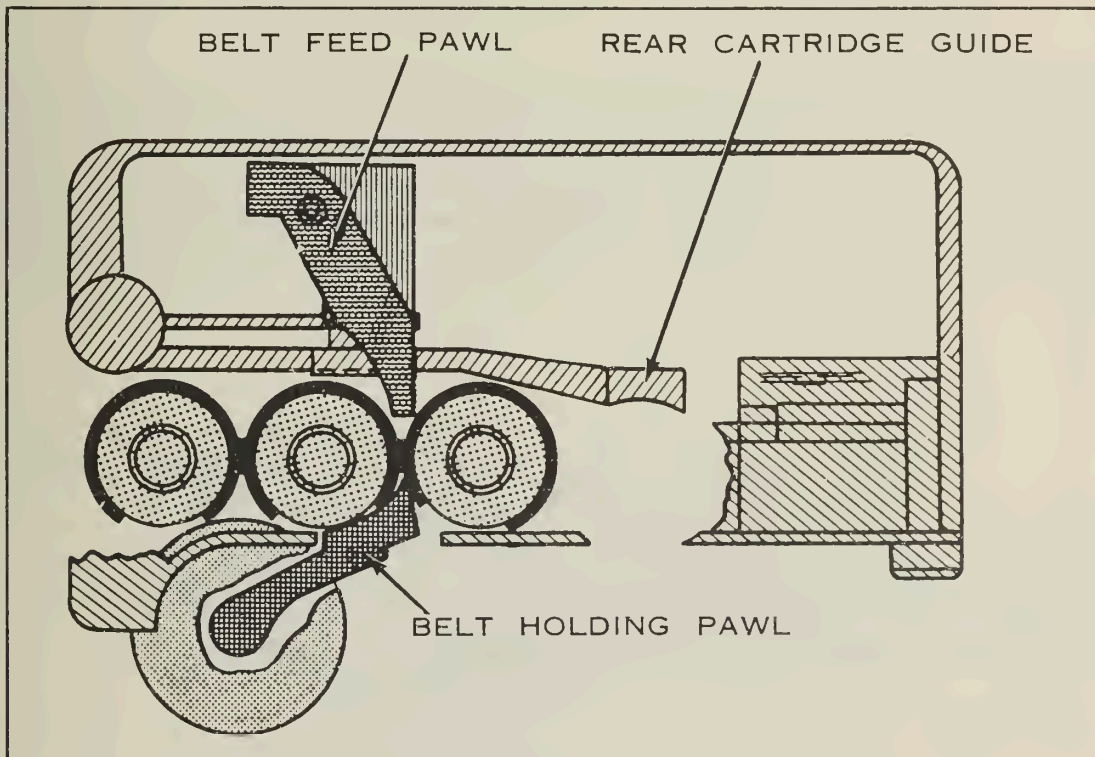


Figure 58.--First Round Right of the Belt Holding Pawl and Belt Feed Pawl.

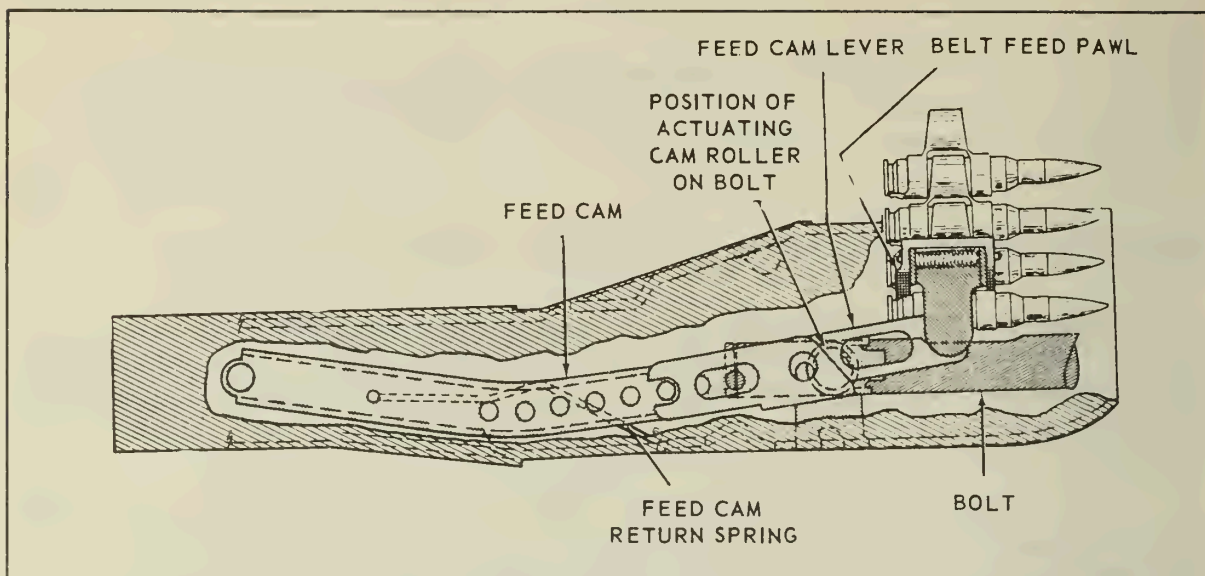


Figure 59. --Feeding - Bolt Forward.

pawl are positioned between the first and second rounds in the belt of ammunition. (See fig. 58.) When the bolt is forward, the feedcam is held to the right side of the feedcover by the actuating cam roller. (See fig. 59.) The gunner pulls the cocking lever handle to the rear, causing the stud on the cocking lever to engage the operating rod yoke moving it and the bolt to the rear. With the assistance of the feedcam return spring, the actuating cam roller working in the feedcam moves the feedcam to the left as the

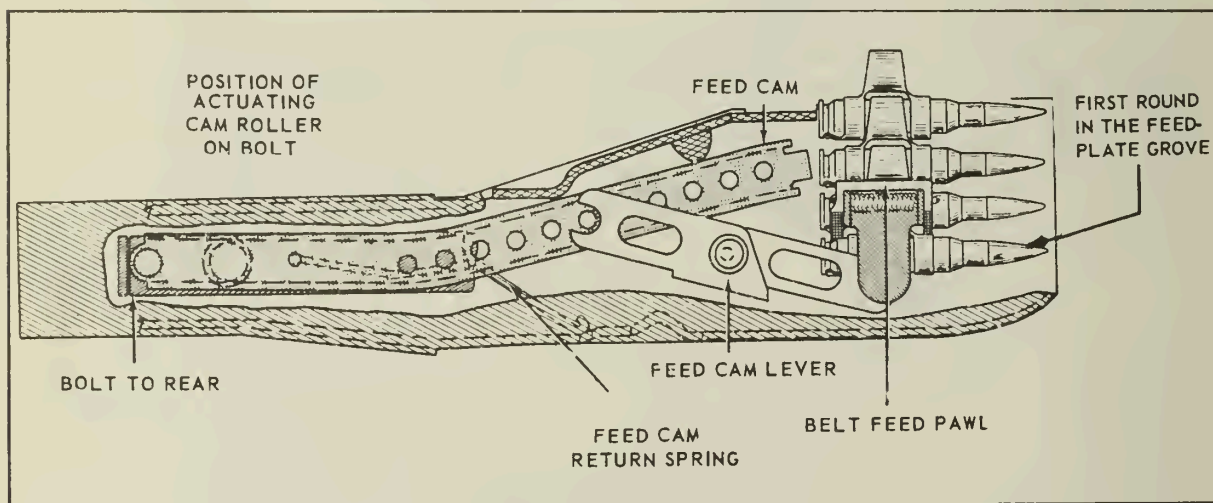


Figure 60. --Feeding - Bolt to the Rear.

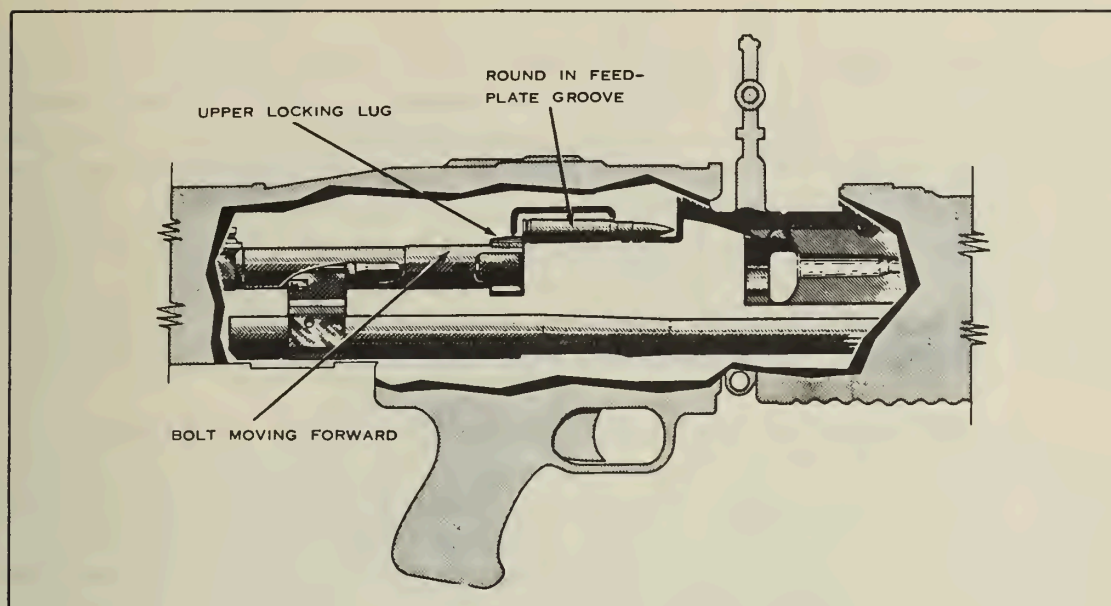


Figure 61. --Chambering - Bolt Contacting the Cartridge.

bolt moves to the rear. The belt feed pawl moves to the right, positioning the first round in the feedplate groove. (See fig. 60.) When the bolt is all the way to the rear, the sear shoulder engages in the sear notch of the operating rod, holding the bolt and operating rod to the rear. The trigger

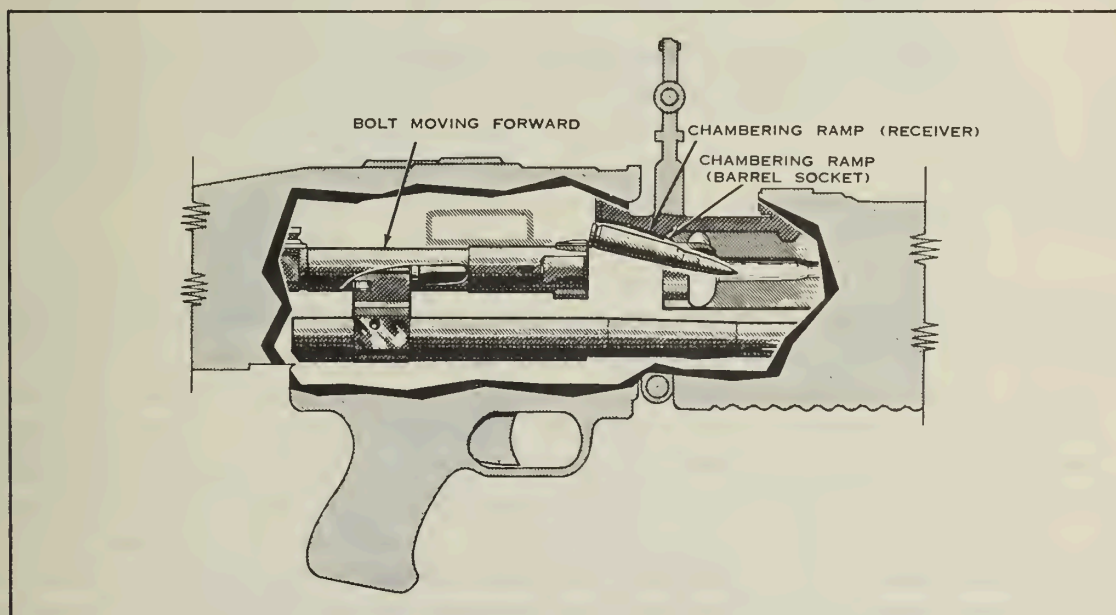


Figure 62. --Chambering - Cartridge Entering the Chamber.

is squeezed disengaging the sear shoulder from the sear notch and allowing the operating rod and bolt to move forward under the force of the expanding operating rod drive spring. The bolt moves forward causing the feedcam to move to the right and the belt feed pawl to the left. The belt feed pawl, being under spring tension, moves up and over the second round. When the belt feed pawl is positioned to the left of the second round in the belt of ammunition, feeding is completed. When loading with the feedcover raised and the bolt to the rear, feeding begins when the first round is positioned in the feedplate groove. It is completed as described above.

b. Chambering. --Chambering begins when the raised portion of the upper locking lug of the bolt comes in contact with the base of the cartridge. This occurs after a round is positioned in the feedplate groove and while the bolt is moving forward under the force of the expanding operating rod drive spring. The front and rear cartridge guides exert a downward pressure on the round so that the bolt will not ride under the cartridge. The front cartridge guide is built lower than the rear cartridge guide to prevent the link from moving forward with the round. The bolt continues forward, stripping the round from the link. The nose of the round strikes the chambering ramp in the receiver and is deflected down where it contacts the chambering ramp in the barrel socket. The round continues into the chamber and when it is fully seated, the extractor snaps into the extracting groove of the cartridge, the ejector spring is compressed, and chambering is completed. (See figs. 61 and 62.)

c. Locking. --Locking begins when the locking lugs of the bolt make contact with the locking cams in the barrel socket. The cut of the locking cams in the barrel socket causes the bolt to rotate in a clockwise direction. When the bolt has rotated a quarter turn clockwise and is fully locked to the barrel socket, locking is completed. (See fig. 63.)

d. Firing. --In the movement forward of the bolt and operating rod, the operating rod yoke is positioned in the curved portion of the bolt camming slot. As the bolt makes its quarter turn clockwise, the bolt camming slot allows the bolt to move around the operating rod yoke. When the bolt has completed its quarter turn clockwise, the operating rod yoke is aligned with the straight portion of the bolt camming slot. At this time, the bolt is locked to the barrel socket and cannot move forward. The operating rod continues forward independently as its yoke moves down the straight portion of the bolt camming slot. The operating rod yoke carries the firing pin forward until the firing pin striker moves through the firing pin aperture in the face of the bolt, striking the primer of the round. Firing begins when the

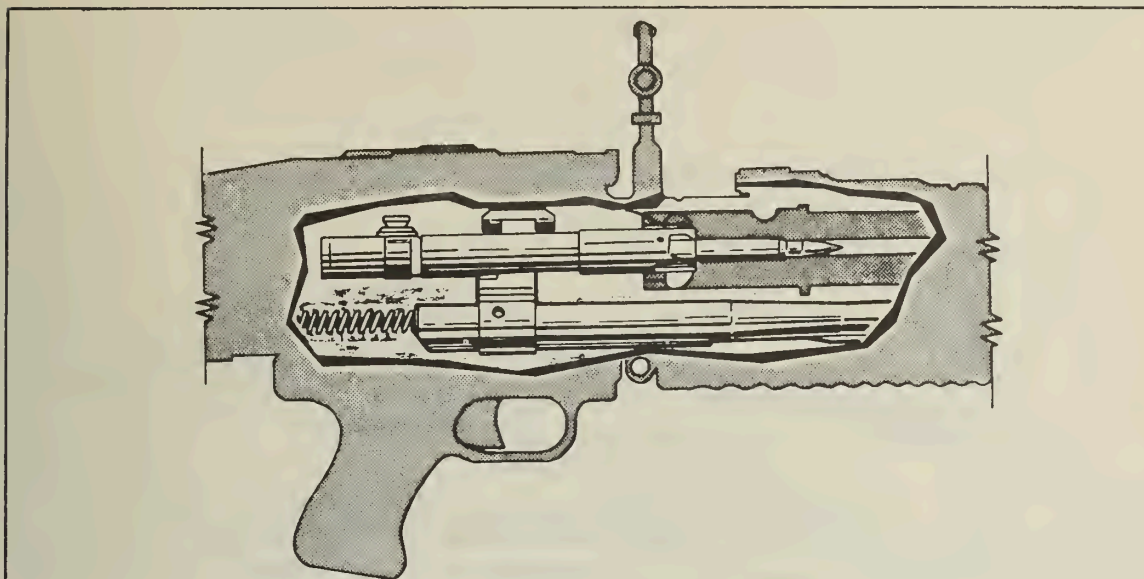


Figure 63. --Locking Completed.

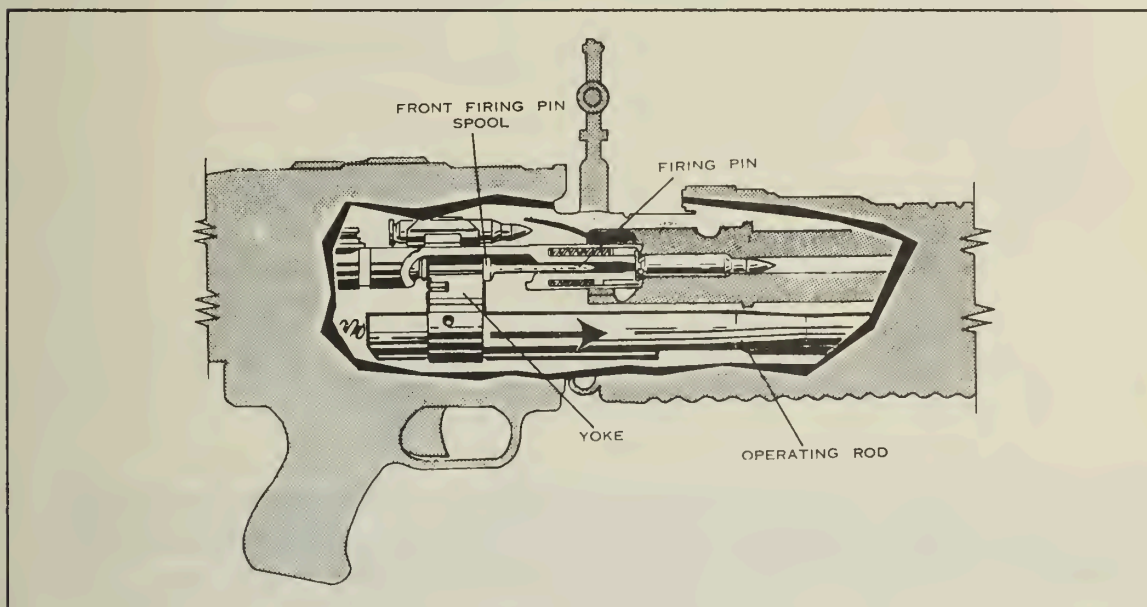


Figure 64. --Firing Begins.

operating rod begins to move independently of the bolt and is completed when the primer of the cartridge is ignited. (See fig. 65.)

e. Unlocking. --During the final stages of the forward movement, the front of the operating rod makes contact with the closed end of the gas piston. The piston is pushed to the forward end of the gas cylinder and

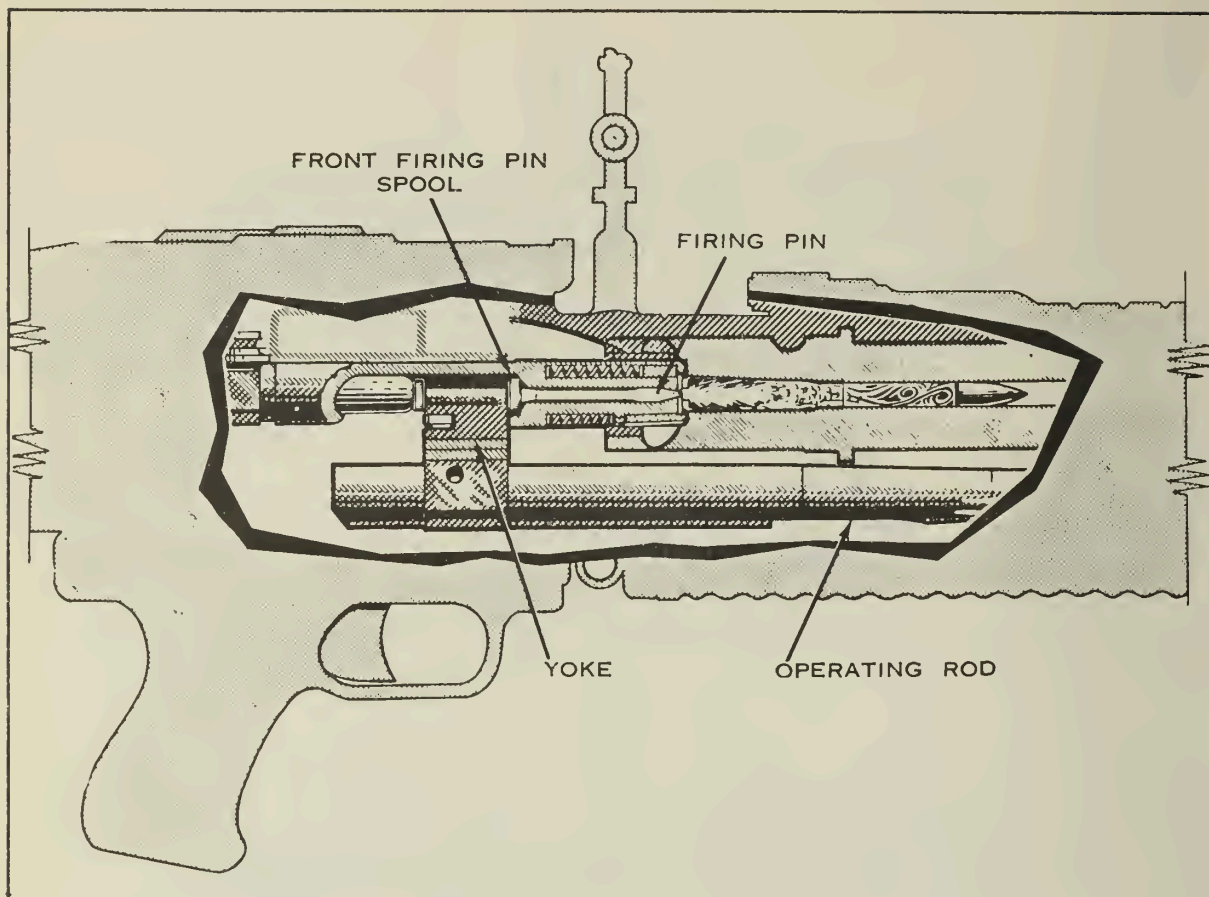


Figure 65. --Firing.

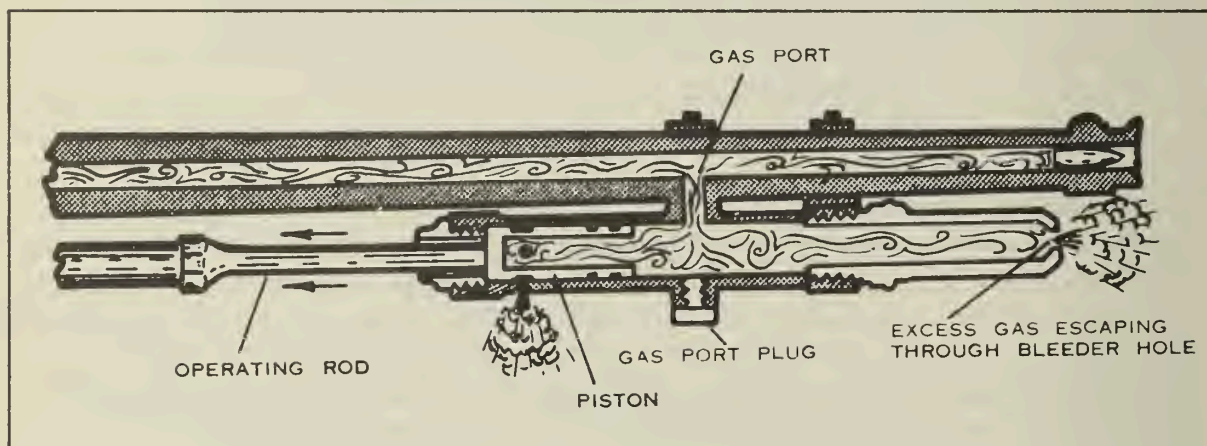


Figure 66. --Action of the Gas.

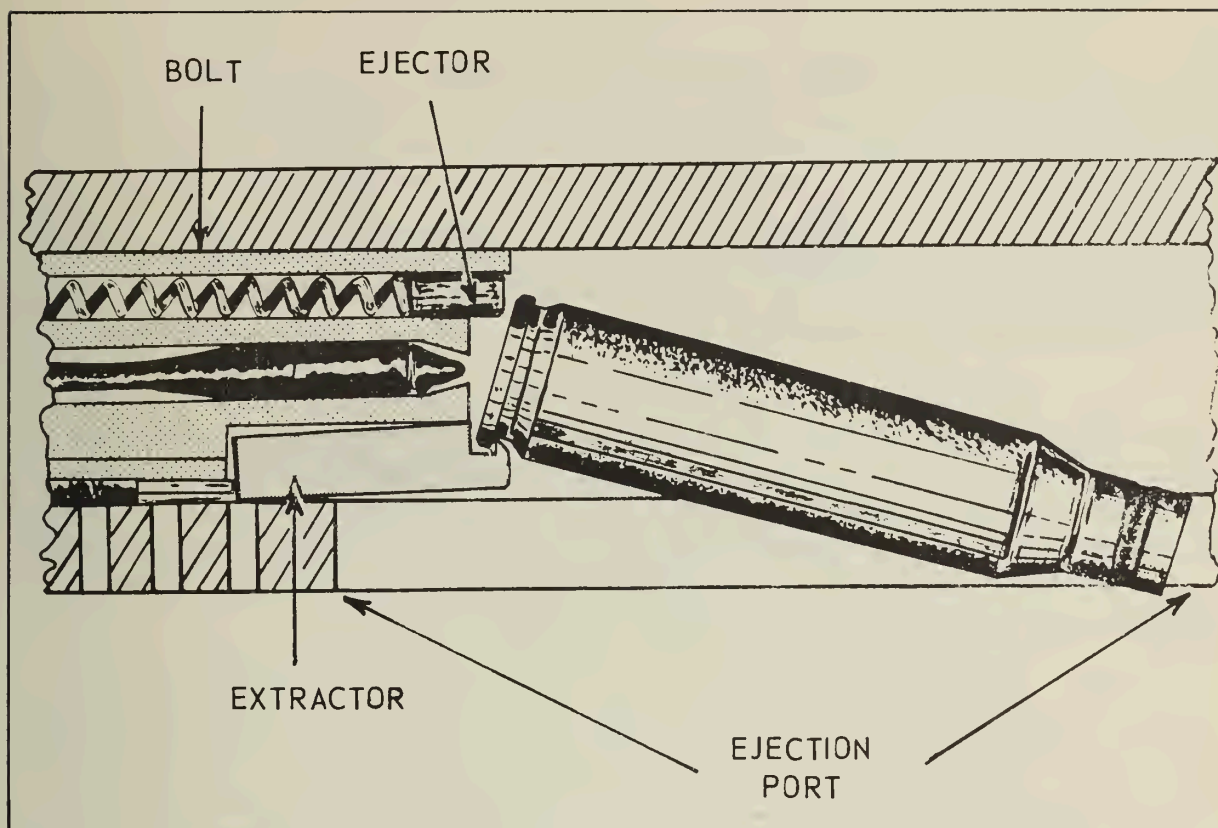


Figure 67. --Extraction and Ejection.

the collecting ring is positioned beneath the gas port. After the round is fired, the expanding gas follows the bullet through the bore. Some of the gas enters the gas port. The gas enters the piston through the gas holes in the collecting ring, fills the piston and the gas cylinder extension, and forces the piston to the rear. The piston drives the operating rod to the rear. (See fig. 66.) The gas escapes through the bleeder hole in the gas cylinder extension and the gas escape holes in the rear of the gas cylinder. As the operating rod moves to the rear, its yoke initially moves through the straight portion of the bolt camming slot. Unlocking begins when the operating rod yoke roller contacts the curved portion of the bolt camming slot. This curved cam forces the bolt to rotate $1/4$ turn counterclockwise through the locking cams in the barrel socket. Unlocking is completed when the locking lugs of the bolt are clear of the barrel socket.

f. Extracting. --Extracting begins with the first movement of the bolt to the rear. Extracting is completed when the front of the cartridge case clears the chamber. Slow initial extraction is accomplished as the bolt unlocks. (See fig. 67.)

g. Ejecting. --Ejecting begins as the front of the cartridge case clears the chamber. The ejector spring expands forcing the front of the cartridge case to ride along the right side of the receiver. Due to the push of the ejector on the left and the pull of the extractor on the right, ejecting is completed when the cartridge case is spun from the receiver as it reaches the ejection port. At about the same time, the empty link is pushed from the link ejection port by the next round as it moves into the feedplate groove. (See fig. 67.)

h. Cocking. --Cocking begins as the operating rod starts to the rear. The rear of the operating rod yoke bears against the rear firing pin spool withdrawing the firing pin striker from the face of the bolt. The firing pin moves to the rear, compressing the firing pin spring. Cocking is completed when the firing pin striker is withdrawn from the face of the bolt, the firing pin spring is compressed, and the bolt has moved far enough to the rear to pick up another round.

Section IV. MALFUNCTIONS AND STOPPAGES

1401. MALFUNCTIONS

A malfunction is a failure of the gun to function satisfactorily. Defective ammunition or improper operation of the gun by a crew member is not considered a malfunction. Two of the more common malfunctions of the M60 are sluggish operation and runaway gun.

a. Sluggish Operation. -- Sluggish operation of the gun is usually due to excessive friction caused by dirt, improper lubrication, burred parts, or excessive loss of gas. Excessive loss of gas is usually due to a loose or missing gas port plug. To remedy sluggish operation, clean, lubricate, and replace parts as necessary.

b. Runaway Gun. -- A runaway gun is a gun that continues to fire after the trigger is released. It may be caused by a worn sear or a worn sear notch. In the case of a worn sear or sear notch, parts must be replaced as necessary. When short recoil is experienced, it is usually caused by excessive loss of gas. The bolt goes far enough to the rear to pick up the next round, but not far enough to the rear for the sear to engage the sear notch. Normally, tightening the gas system will correct this malfunction. The action taken on experiencing a runaway gun is dependent on the method of firing.

(1) If the gun is mounted on a tripod, bipod, or pedestal mount, the gunner holds the gun on the target. The team leader twists the belt and breaks it.

(2) If the gun is being fired from one of the assault positions, the gunner holds the gun on target until all rounds are expended. No one will attempt to break the belt of ammunition because doing so would pull the gun off target and possibly endanger troops.

1402. STOPPAGES

A stoppage is any interruption in the cycle of functioning caused by faulty action of the gun or faulty ammunition. The gunner must reduce the stoppage and continue firing.

a. Immediate Action. --Immediate action is the procedure taken to reduce a stoppage without investigating its cause. To apply immediate action, raise the feedcover and remove the ammunition and links. Pull the cocking lever handle to the rear and return it forward. Raise the feedplate and inspect the chamber.

(1) If the chamber appears to be clear, run a cleaning rod through the bore, reload, relay, and attempt to fire.

(2) If there is a live round in the chamber, close the feed-cover and pull the trigger.

(a) If the round fires, reload and continue to fire.

(b) If the round does not fire, and the gun is hot, leave the gun alone for five minutes due to the possibility of a cookoff. (NOTE: 150 rounds fired in a two minute period may heat the barrel sufficiently to cause a cookoff. This will normally occur from ten seconds to five minutes after chambering a live round.) After waiting five minutes, remove the live round, reload, relay, and continue to fire. No delay is required if the gun is not hot.

(3) If there is a live round visible that is not fully chambered, the previous round ruptured during extraction. The live round is jammed in the forward portion of the ruptured cartridge case. Push the live round from the chamber with a cleaning rod inserted from the muzzle, change barrels and continue the mission. The ammunition bearer uses the ruptured cartridge extractor attached to a section of cleaning rod to remove the ruptured cartridge.

b. Subsequent Action. --Subsequent action is taken when immediate action fails to reduce a stoppage. A detailed inspection is made of the gun and ammunition to determine the cause of the stoppage. The following stoppages, their probable causes and remedies are provided to aid in determining the nature of the stoppage and how to reduce it.

<u>FAILURE TO</u>	<u>PROBABLE CAUSE</u>	<u>ACTION</u>
Feed -----	Defective feedcover parts. Broken bolt plug. Links in feedplate.	Replace feedcover. Replace. Clear feedplate.
Chamber ---	Damaged upper locking lug.	Replace bolt.

	Defective cartridge guides.	Replace feedcover.
	Obstruction in chamber.	Remove obstruction.
	Weak operating rod drive spring.	Replace spring.
	Dirty chamber.	Clean.
	Dirty or corroded ammunition.	Replace.
	Protruding ejector pin.	Replace.
Lock -----	Dirty locking recesses.	Clean.
	Weak operating rod drive spring.	Replace.
	Damaged bolt locking lugs.	Replace bolt.
	Damaged barrel socket.	Replace barrel.
Fire -----	Defective ammunition.	Replace.
	Broken firing pin.	Replace.
Unlock ----	Damaged bolt locking lugs.	Replace bolt.
	Damaged barrel socket.	Replace barrel.
	Dirty chamber.	Clean.
	Insufficient gas.	Tighten gas system.
	Damaged operating rod yoke.	Replace operating rod.
	Broken firing pin.	Replace.
Extract ----	Dirty chamber.	Clean.
	Broken extractor.	Replace bolt.
	Insufficient gas.	Tighten gas system.
	Defective ammunition	Replace.
Eject -----	Broken ejector.	Replace bolt.
	Jammed extractor.	Replace bolt.
	Insufficient gas.	Tighten gas system.
Cock -----	Insufficient gas.	Tighten gas system.
	Broken firing pin.	Replace.

Section V. MAINTENANCE

1501. GENERAL

The crew of the machinegun is responsible for its maintenance. Maintenance includes inspection, cleaning, and replacement of parts.

1502. CLEANING MATERIALS AND LUBRICANTS

a. Materials

(1) Bore cleaner is used to clean the gas system, the chamber, and the bore. It will provide protection from rust.

(2) Hot soapy water or plain hot water may be used when bore cleaner is not available. After using water on the machinegun, thoroughly dry and oil all parts.

(3) Cleaning solvent is used to clean guns that have grease or rust preventative compounds on them. After using cleaning solvent, immediately dry and oil the gun. Do not allow solvent to contact the rubberized parts of the machinegun.

b. Lubricants

(1) Special preservative lubricating oil is used for lubrication at normal and low temperatures.

(2) Medium preservative lubricating oil is used for high temperatures, high humidity, or when guns are exposed to salt water.

(3) SAE 10 engine oil may be used in lieu of preservative lubricating oils if preservative oils are not available. In cold weather, engine oil will cause sluggish operation of the gun. Clean the gun and recoil it frequently when engine oil is used.

1503. SPARE BARREL CASE

A complete set of maintenance equipment is issued with each gun. This material is carried in the pockets provided on the spare barrel case. (See fig. 68.) The case should not show signs of excessive washing.

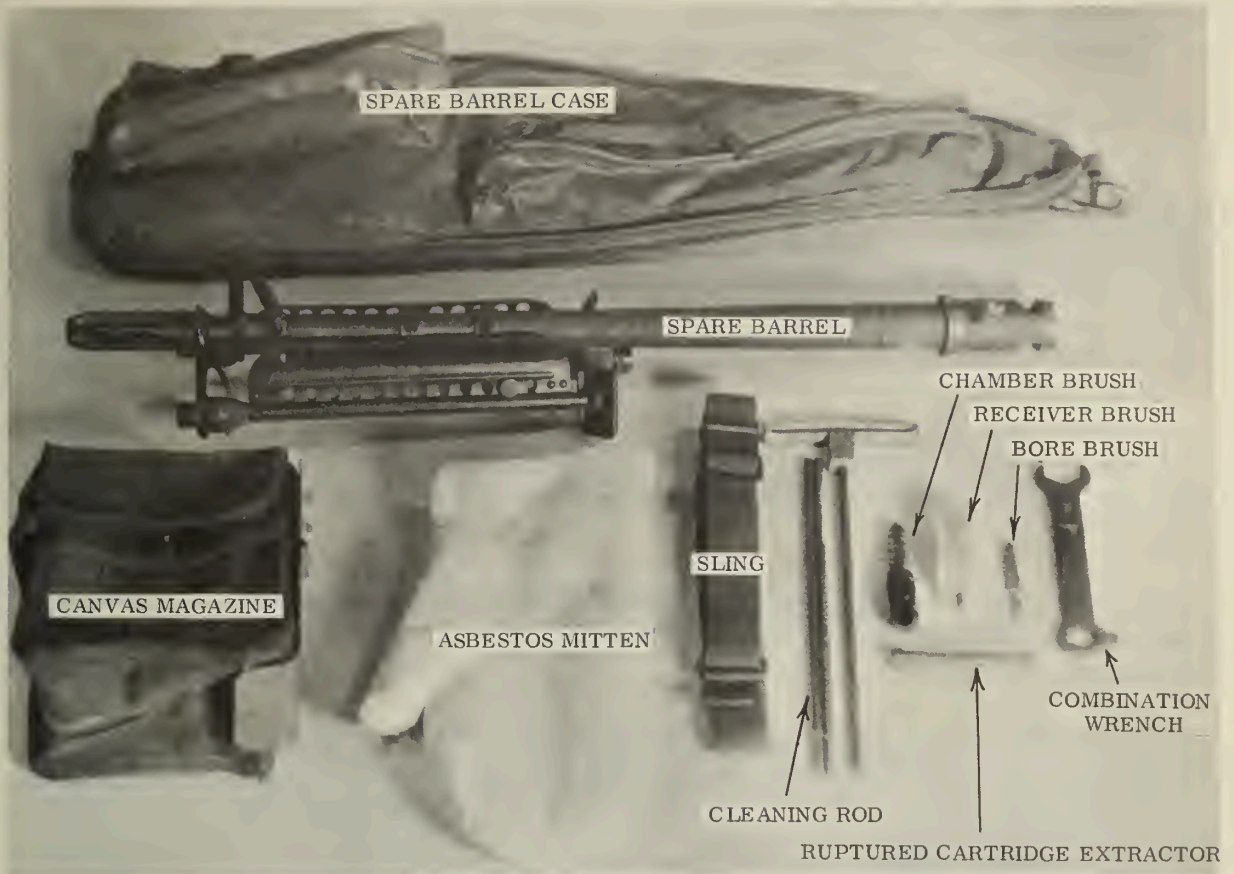


Figure 68. --The Spare Barrel Case.

Frequent washing of the case destroys its waterproofing and causes the canvas to deteriorate.

1504. ACTIONS BEFORE, DURING, AND AFTER FIRING

a. Before Firing. --Inspect the weapon for cleanliness and proper mechanical condition. Remove the barrel and check the locking recesses for cleanliness and burrs. Run a dry patch through the bore to remove excess oil and possible obstructions. Place a light coat of oil on the bolt and receiver rails.

b. During Firing. --Maintain a light coat of oil on moving parts where friction may occur. Change the barrel after firing the rapid rate of fire for two minutes or the sustained rate of fire for 10 minutes.

c. After Firing. --Thoroughly clean the gun for three consecutive days to remove all powder residue. Inspect the gun for carbon deposits and remove them with brushes and bore cleaner.

1505. NORMAL MAINTENANCE

Inspect the gun daily for rust. A light coat of oil is maintained on all metal parts except the gas piston, inside the gas cylinder, and the buffer. Ensure that oil does not get inside the buffer. Clean the gas system when the gun operates sluggishly or after each day's firing.

1506. SPECIAL MAINTENANCE

a. Cold Climate. --The gun must be kept free of excess oil and moisture which will cause it to operate sluggishly. If brought indoors, allow the gun to come to room temperature then wipe it completely dry and lightly oil it.

b. Hot Humid Climates. --Inspect the gun frequently for signs of rust. Keep the gun free from moisture and oiled with medium preservative lubricating oil.

c. Hot Dry Climates. --Clean the gun daily. In sandy or dusty areas keep the gun free of oil to prevent the collection of sand and dust in working parts.

1507. MAINTENANCE FOLLOWING NBC ATTACK

a. General. --If a nuclear, biological, or chemical attack is anticipated, or if contamination is encountered, apply oil to all outer metal surfaces of the machinegun and accessories. DO NOT APPLY OIL TO AMMUNITION. If the gun is not to be used, cover it, the accessories, and ammunition with protection coverings. Keep ammunition in containers as long as possible. After an NBC attack, determine by means of the provided detectors whether or not the equipment is contaminated.

b. Not Contaminated. --If not contaminated, normal cleaning will suffice.

c. Contaminated. --During decontamination, wear a complete set of protective clothing, including gloves. Decontaminate the gun as prescribed in FM 21-40 and TM 3-220. If the tactical situation prohibits complete and immediate decontamination, clean those parts that will come in contact with personnel during firing. If contamination is too great, take action to replace the equipment.

Section VI. MOUNTS

1601. GENERAL

The M60 machinegun is normally fired from either the bipod or the tripod mount. From the prone position, the gunner can fire the gun using the hinged shoulder rest and the organic bipod. The M122 tripod is used when increased stability and accuracy are desired, and when delivering predetermined fire.

1602. BIPOD MOUNT

The bipod is part of the barrel group and is not removed from the barrel by using troops. (See fig. 69.)

a. To lower the bipod, pull to the rear on the leg, compressing the leg lock. Lower the leg. It automatically locks in the downward position.

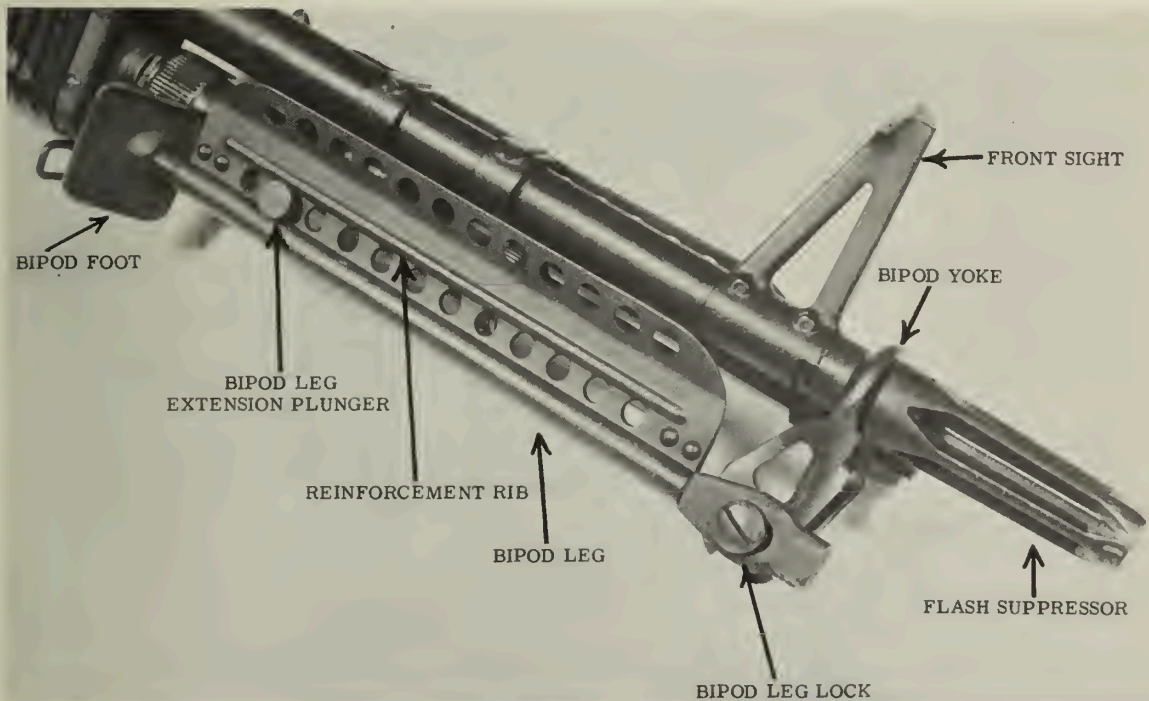


Figure 69. --The Bipod Assembly.

b. To increase the length of the bipod leg, pull down on the bipod foot. The bipod leg extension is drawn out of the bipod leg and is held at the desired length by the bipod leg extension plunger. To replace the extension, press in on the plunger and push up on the bipod foot.

c. To position the bipod back alongside the barrel, pull down on the bipod leg and raise it. It automatically locks into position.

d. The prone position is used when firing from the bipod. The right hand is used to fire the gun and the left grasps the rear of the feed-cover palm down. The right shoulder is placed beneath the hinged shoulder rest and firmly against the butt stock.

1603. M122 TRIPOD MOUNT

This mount is composed of two main groups: the tripod with gun platform and pintle, and the traversing and elevating mechanism. It is

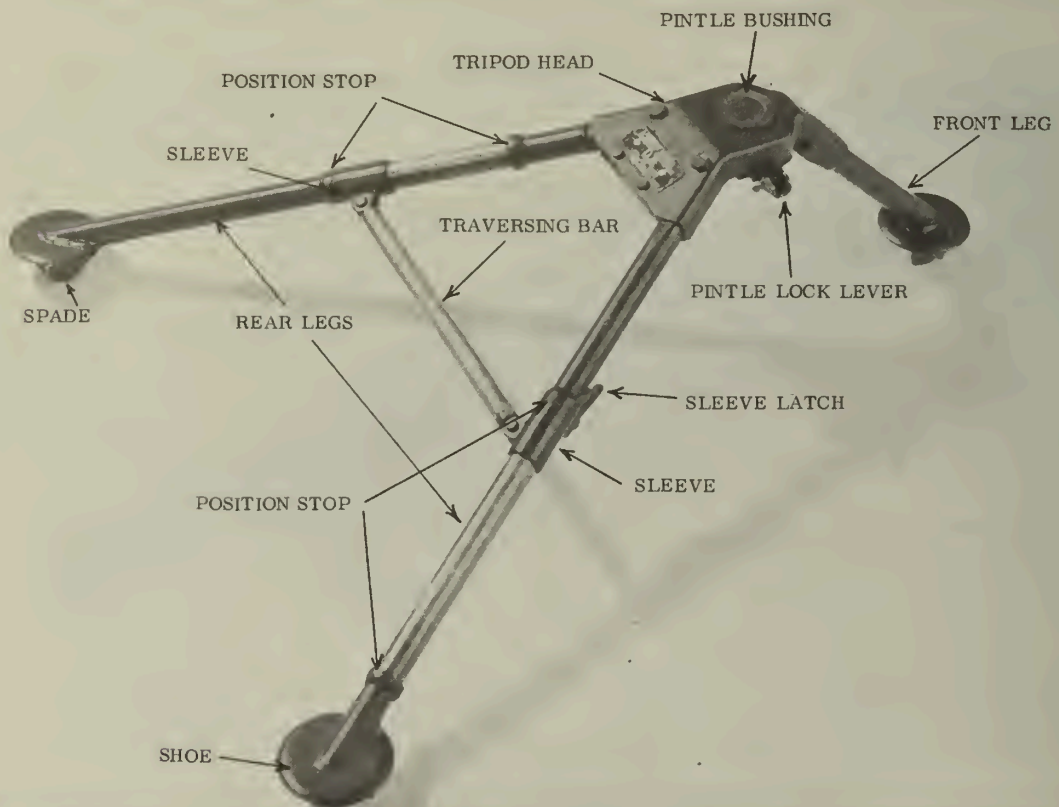


Figure 70. --The Tripod.

light, yet furnishes a strong mount for the gun. (See figs. 70, 71, 72, and 73.)

a. The Tripod. --(See fig. 70.) The central portion of the tripod is the tripod head. The pintle bushing which surrounds the pintle well is located in the middle of the tripod head. On the right of the tripod head is the pintle lock lever. The front and the two rear legs each have circular shoes. Beneath the shoes are the spades. The traversing bar connects the rear legs. The traversing bar has an engraved mil scale totaling 875 mils. It is graduated from zero in the center to 450 mils on the left and 425 mils on the right. It is marked every five mils and numbered every hundred. This is a direction scale. Since we read direction from the way the muzzle is pointing, the mil scale on the traversing bar is read backwards. For example, a 200-mil reading on the left side of the bar is actually a Right 200 reading since the muzzle is pointing to the right. The traversing bar is held to the rear legs by a sleeve at each end of the bar. There are two position stops on each rear leg. This allows the rear legs to be open or closed. There is a sleeve latch on the right rear leg to engage the sleeve and lock the legs open.

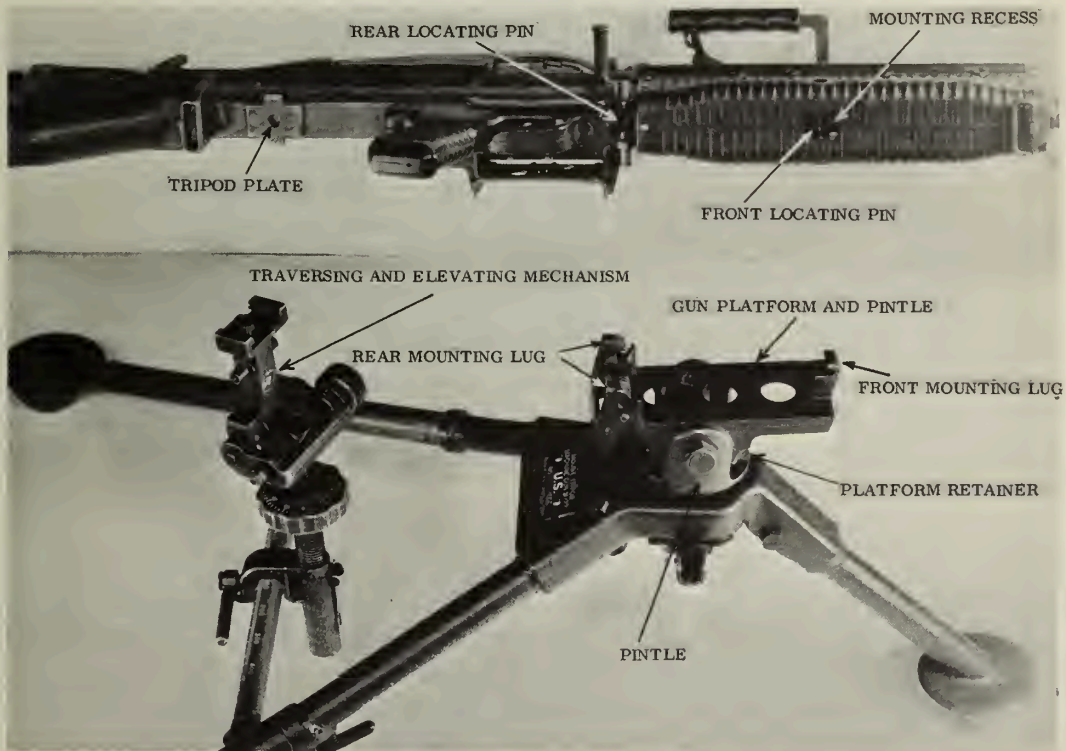


Figure 71. --M122 Tripod Mount.

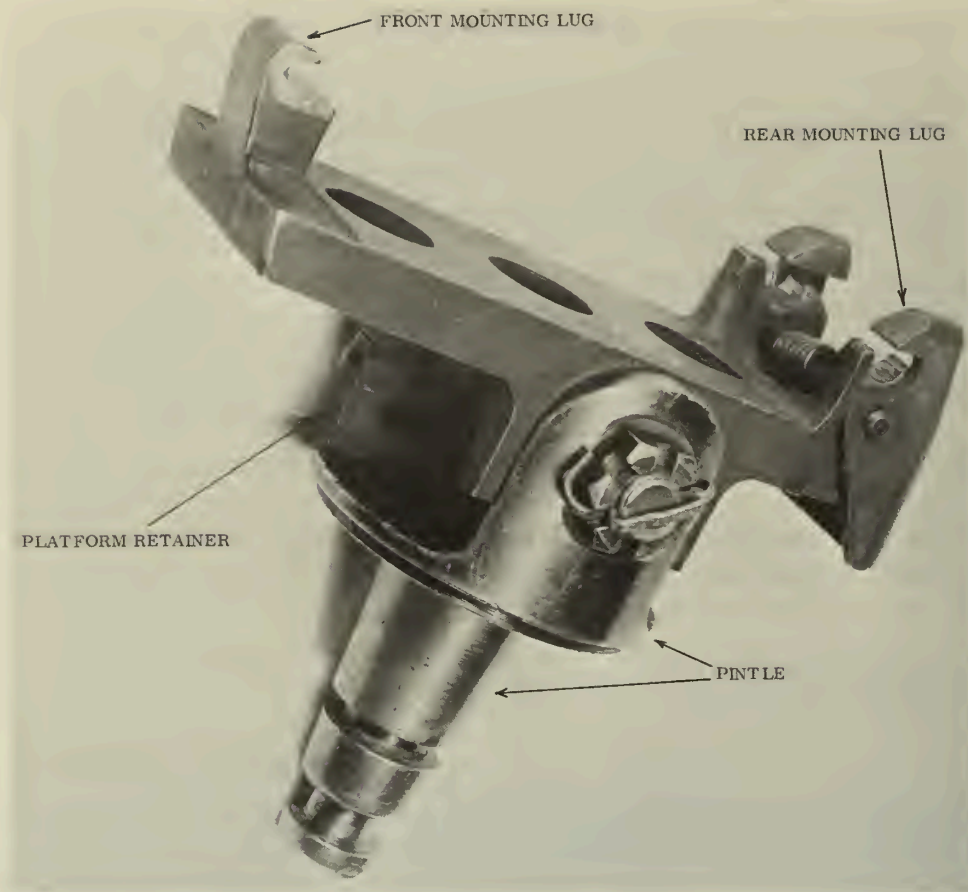


Figure 72. --Gun Platform and Pintle.

b. The Gun Platform and Pintle. --(See fig. 72.) The gun platform has a front and a rear mounting lug which engage the locating pins on the bottom of the receiver of the gun. It is attached by a bolt to the pintle, which is designed to mount on the tripod head. Beneath the gun platform is the platform retainer. This may be lowered when mounting the gun. It prevents movement of the gun platform.

c. The Traversing and Elevating Mechanism. --(See fig. 73.) The traversing and elevating mechanism controls direction and elevation when firing from the tripod. The upper section controls direction; the lower section, elevation.

(1) The traversing portion of the mechanism consists of the traversing handwheel, the traversing screw, and the offset head. The

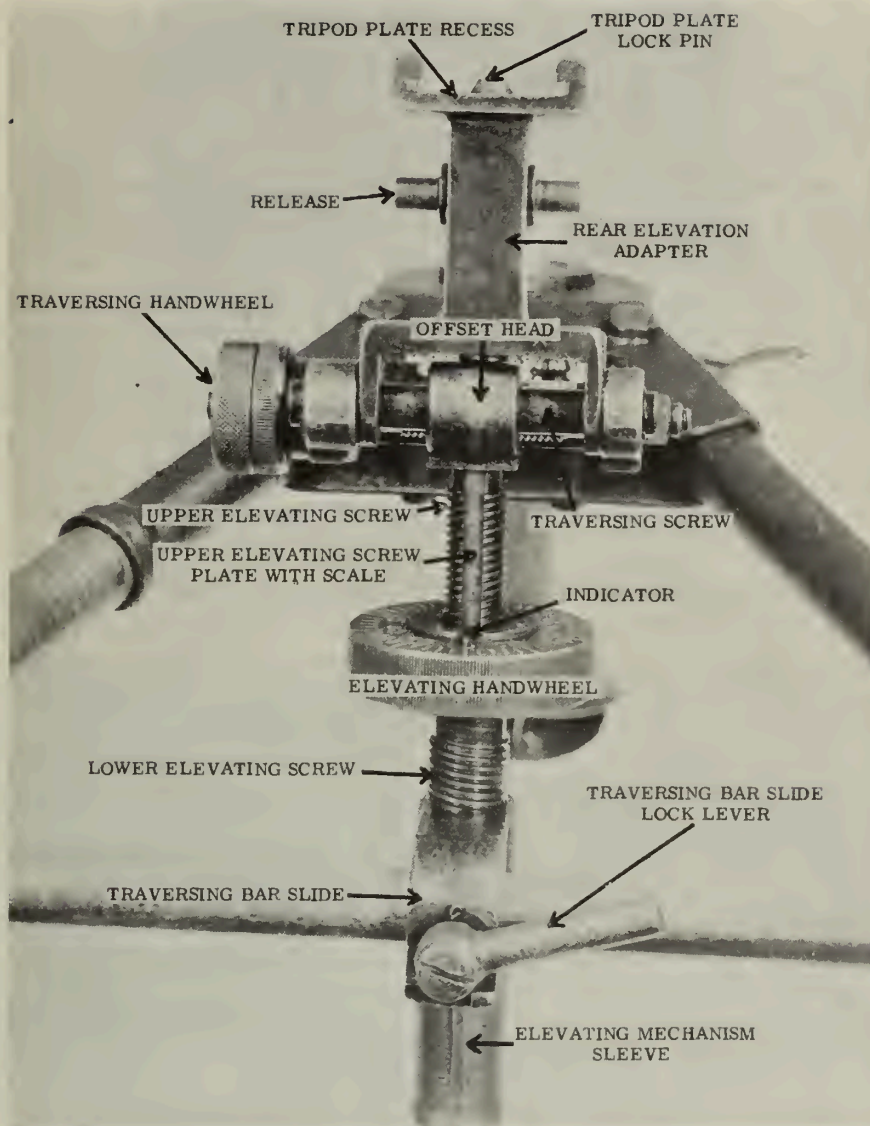


Figure 73. --The Traversing and Elevating Mechanism.

traversing handwheel has a built-in mil click system. One click equals a change of direction of one mil. The scale on the traversing handwheel is marked every mil and numbered every five mils to a total of 25. The traversing handwheel can make approximately two complete turns either right or left when the offset head is centered on the traversing screw, for a total of approximately 100 mils.

(2) The elevating portion of the mechanism consists of the upper elevating screw, the elevating handwheel, the lower elevating screw, and the elevating mechanism sleeve. The upper elevating screw has an engraved scale which runs from plus 200 to minus 200 mils. It is marked and numbered every 50 mils. In addition to this 400 mils of controlled elevation, the elevating handwheel may be turned an additional 65 clicks (approximately) above the plus 200 graduation when the gun is at or near center on the mount. If the muzzle is well to the right or left, however, the elevating handwheel will bind on the rear legs, reducing controlled elevation to a total of about 350 mils. Beneath the upper elevating screw is the elevating handwheel. It is also scaled. It is marked every mil and numbered every five mils to a total of 50. A stationary indicator is located on top of the wheel at the bottom of the upper elevating screw. Beneath the elevating handwheel is the lower elevating screw. The lower elevating screw mates with the elevating mechanism sleeve. The elevating mechanism sleeve has a U shaped projection to the rear with a lever on it. This is the traversing bar slide with the traversing bar slide lock lever. This slide is locked to the traversing bar when firing and direction readings are read off the traversing bar at the left edge of the traversing bar slide.

1604. MOUNTING THE GUN

a. Open the tripod by folding out the front leg, then separating the rear legs until the sleeve latch engages the sleeve on the right leg. Insert the front mounting lug on the gun platform into the mounting recess in the forearm assembly so that the front locating pin engages the lug. Press the rear mounting lug against the rear locating pin. The lug is under spring tension and will snap over the pin. (See fig. 74.) Ensure that the pintle lock lever on the tripod head is raised. Set the gun on the tripod with the pintle in the pintle well. (See fig. 75.) Lower the pintle lock lever.

b. Lower the muzzle of the gun. Rotate the elevating handwheel until approximately 1-1/2 inches of thread are visible above and beneath it. Turn the traversing handwheel until the offset head is centered on the traversing screw and the scale on the wheel is at zero. Ensuring that the traversing handwheel is to the left and the traversing bar slide is to the rear, pull down on the tripod plate lock pin release on the rear elevation adapter. Slide the tripod plate recess over the tripod plate from the rear, then let go of the release. (See fig. 76.) Next, lower the rear of the gun and lock the traversing bar slide to the traversing bar with the traversing bar slide



Figure 74. --Mounting the Gun Platform and Pintle to the Gun.



Figure 75. --Mounting the Gun on the Tripod.



Figure 76. --Mounting the Traversing and Elevating Mechanism on the Tripod.

lock lever. The left side of the slide is placed at the zero graduation of the scale on the traversing bar. The gun is mounted and centered on the mount.

c. The prone position is used when firing from the tripod. The hinged shoulder rest is not used. The right hand fires the gun and the left is placed palm down on the elevating handwheel. Both hands pull the gun firmly back into the right shoulder. All manipulation is accomplished with the left hand.

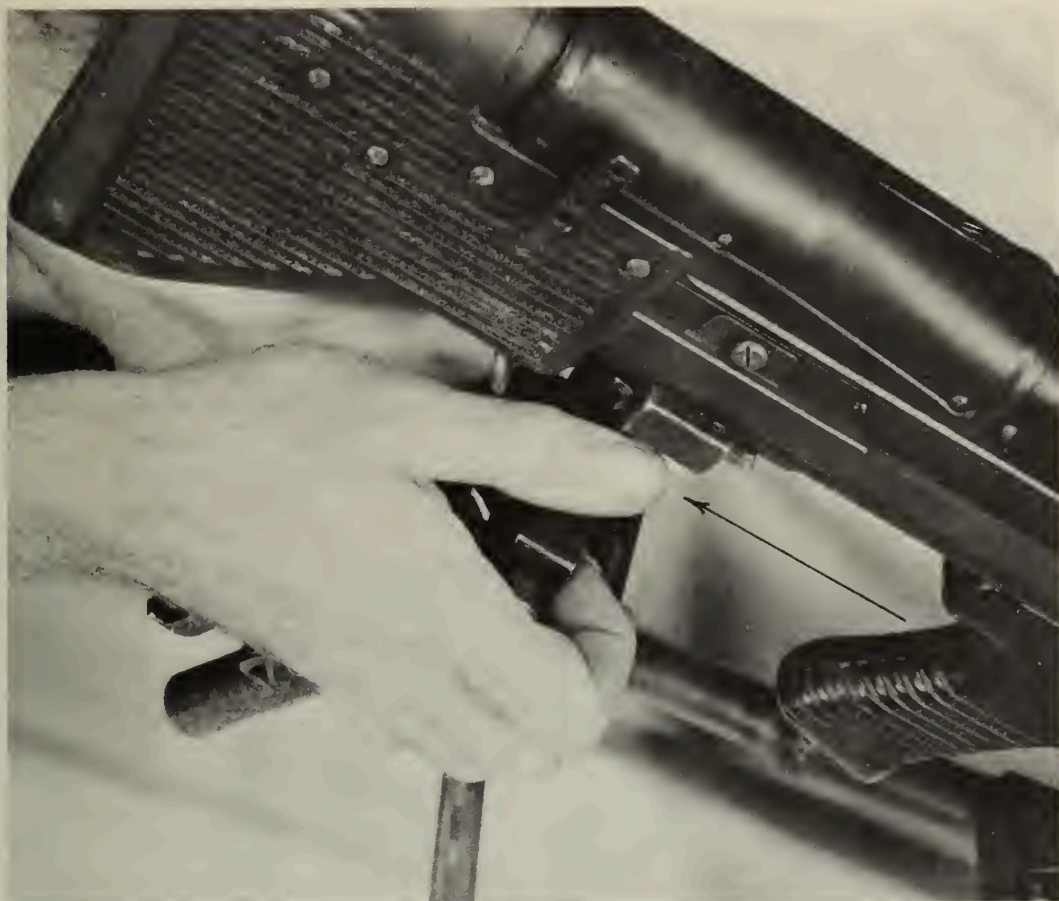


Figure 77. --Dismounting the Gun.

1605. DISMOUNTING THE GUN

a. Release the traversing bar slide lock lever and raise the rear of the gun. Pull down on the release and pull the traversing and elevating mechanism straight off the gun to the rear. (See fig. 77.)

b. Raise the pintle lock lever and lift the gun from the tripod. Remove the pintle and gun platform by pressing in on the rear mounting lug on the gun platform and swinging the pintle and gun platform down and toward the muzzle.

c. Squeeze the sleeve latch on the right rear leg and collapse the tripod.

Section VII. AMMUNITION

1701. GENERAL

This section describes the ammunition used with the M60 machinegun. Ammunition is issued as complete rounds consisting of the projectiles (bullets), cartridge cases, propellant powder, and primers. Ammunition is issued in a disintegrating metallic split linked belt. (See fig. 78.) The members of machinegun teams must be able to recognize the types of ammunition available and know how to care for them.

- a. Classification. --Ammunition is classified as listed:



Figure 78. --100-Round Bandoleer.

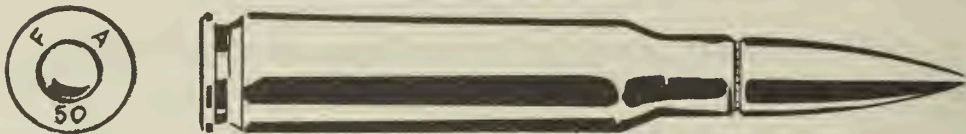
- (1) The tracer cartridge is used for observation of fire, incendiary effect, signalling, and marking targets.
- (2) The ball cartridge is used against targets of light material, personnel, and during marksmanship training.
- (3) The blank cartridge is used during training when simulated fire is desired.
- (4) The dummy cartridge is used during training. It is completely inert, but simulates service ammunition for practice in loading the gun.
- *(5) The armor-piercing cartridge is used against lightly armored targets where armor-piercing effects are desired.
- *(6) The armor-piercing incendiary cartridge is used for armor-piercing effects combined with fire producing (incendiary) effects.

* Not authorized for training purposes.

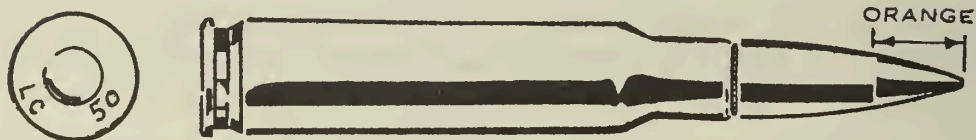
b. Identification. --The type, caliber, model, and ammunition lot number, including the symbol of the manufacturer, are necessary for complete identification of small arms ammunition. The 7.62mm NATO cartridge is completely identifiable by its appearance: the painting of the bullet tip, the stamping of the manufacturer's initial and year of manufacture on the base of the cartridge case, and the markings on the packing containers. When removed from their original packing containers, the cartridges may be identified by physical characteristics as follows: (See fig. 79.)

<u>TYPE</u>	<u>IDENTIFICATION</u>
Tracer -----	Tip of bullet is painted orange for a distance of approximately 3/10 inch.
Ball -----	All gilding metal jacket on bullet. Linked with tracer ammunition for field use in the ratio four ball to one tracer.
Blank -----	Gilding metal jacket on narrow nose. Metal jacket extends from the base of the cartridge to the end of the nose.
Dummy -----	Corrugated or three holes in body of cartridge case. No markings on bullet.

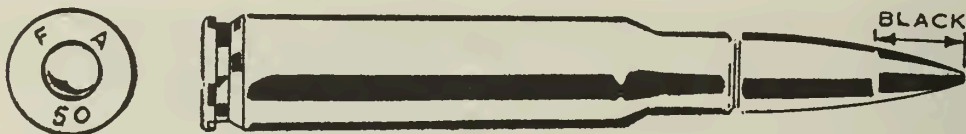
CARTRIDGE 7.62 MILLIMETER BALL NATO



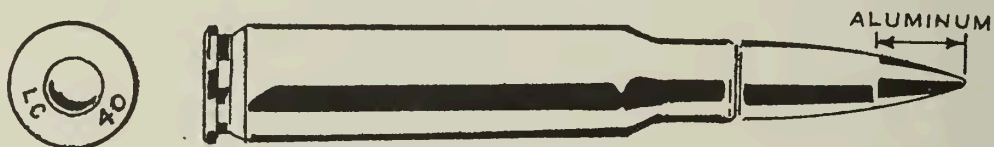
CARTRIDGE 7.62 MILLIMETER TRACER NATO



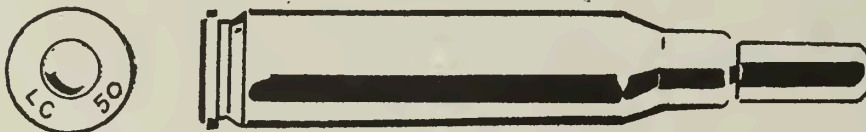
CARTRIDGE 7.62 MILLIMETER ARMOR PIERCING NATO



CARTRIDGE 7.62 MILLIMETER ARMOR PIERCING INCENDIARY NATO



CARTRIDGE 7.62 MILLIMETER BLANK NATO



CARTRIDGE 7.62 MILLIMETER DUMMY NATO

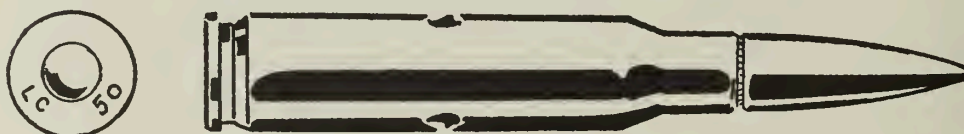


Figure 79.--Ammunition for the M60 Machinegun.

1702. STORAGE

Ammunition should be stored under cover. If it is necessary to leave ammunition in the open, keep it at least six inches from the ground and covered with a double thickness of tarpaulin. Place the tarpaulin so it gives maximum protection and allows free circulation of air. Dig suitable trenches to prevent water from flowing under the ammunition pile.

1703. AMMUNITION PRECAUTIONS

- a. Ammunition containers should not be opened until the ammunition is to be used. Ammunition removed from the airtight containers, particularly in damp climates, is likely to corrode.
- b. Protect ammunition from mud, dirt, and water. If the ammunition gets wet or dirty, wipe it off prior to use. Wipe off light corrosion as soon as it is discovered. Heavily corroded cartridges should be replaced.
- c. Use caution during firing to ensure that ammunition is kept out of the dirt. Dirt picked up during firing will act as an abrasive in the chamber and possible cause damage to personnel and equipment.
- d. Do NOT expose ammunition to direct rays of the sun. If the powder is hot, excessive pressure may be developed when the gun is fired.
- e. Do NOT oil or grease ammunition. Dust and other abrasives will collect on it and injure the operating parts of the gun.
- f. Replace dented cartridges, cartridges with loose projectiles, or other defective rounds.
- g. Do NOT fire over friendly troops any ammunition graded and marked FOR TRAINING USE ONLY.

1704. AMMUNITION PACKAGING

- a. Ammunition is packaged in a metal box containing two bandoleers. Each bandoleer contains 100 rounds and weighs approximately seven pounds. (See fig. 78.) Ammunition in the bandoleers may be hooked

together and fired from the containers, or the bandoleers may be removed for firing.

b. The individual cartridges for this weapon are packed in cartons. Complete data is published in SM 9-5-1305.

1705. DETAILED AMMUNITION INFORMATION

Complete data on 7.62mm ammunition for use in the M60 machine-gun is published in TM 9-1005-224-15.



CHAPTER 2

ORGANIZATION AND MARKSMANSHIP

Section I. ORGANIZATION

2101. GENERAL

There is one weapons platoon in each rifle company. The weapons platoon supports the three rifle platoons in both offense and defense as directed by the company commander. The weapons platoon consists of one officer and 65 enlisted men. The platoon is broken down into a platoon headquarters, a machinegun section, an assault section, and a 60mm mortar section. The platoon headquarters consists of a platoon commander, a platoon sergeant, and a messenger. The 22-man assault section is equipped with six 3.5-inch rocket launchers. The 60mm mortar section of 13 men has three 60mm mortars. The 28-man machinegun section is described below.

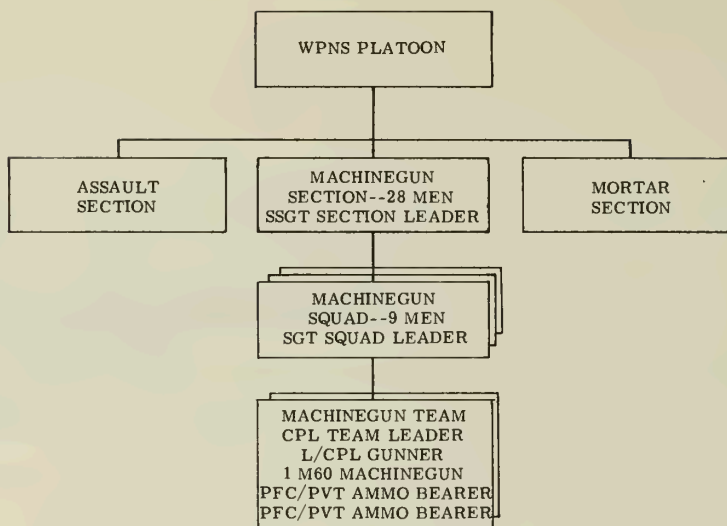


Figure 80. --The Machinegun Section.

2102. MACHINEGUN SECTION

The machinegun section consists of a section leader and three squads. (See fig. 80.)

2103. MACHINEGUN SQUAD

The machinegun squad consists of a squad leader and two 4-man machinegun teams. Each team operates one M60 and is composed of a team leader, a gunner, and two ammunition bearers.

Section II. GUN DRILL

2201. GENERAL

a. Gun drill gives the team members complete confidence in their ability to put the machinegun into action with precision and speed. Rotation of duties during training ensures that every member becomes well trained in each position. Precision is obtained by strict adherence to prescribed procedures. Speed is acquired after precision has been developed. Precision is never sacrificed for speed.

b. Gun drill as discussed here is limited to the squad leader and one machinegun team (team leader, gunner, and two ammunition bearers). When two machinegun teams are employed simultaneously, they are referred to as the Number One and Number Two teams. Number One is always on the right facing in the direction of fire.

c. The squad leader gives his commands from the position of attention. Team leaders and gunners repeat all of his commands. The team leader transmits all signals from the squad leader to the gunner and ammunition bearers, as well as those from the gunner to the squad leader after the gun is mounted.

2202. EQUIPMENT

a. Team Equipment. --In addition to their individual arms and equipment, machinegun team members carry the following:

(1) Squad Leader. --Binoculars and compass.

(2) Team Leader. --Tripod and one bandoleer of ammunition.

(3) Gunner. --Machinegun with gun platform and pintle attached, one bandoleer of ammunition, and combination wrench.

(4) Number One Ammunition Bearer. --Spare barrel case, traversing and elevating mechanism, and one box of ammunition.

(5) Number Two Ammunition Bearer. --Two boxes of ammunition.



Figure 81. --Team Formed on Line.

b. Taking Equipment

(1) The squad leader commands **FALL IN** and the team forms on line with five paces between team members. (See fig. 81.) The squad leader then gives the command **TAKE EQUIPMENT**. Team members take one pace forward and pick up their equipment.

(2) Having taken equipment, the squad leader commands **FORM FOR GUN DRILL**. The team forms in column with five paces between men. The team leader is five paces from, and facing the squad leader. (See fig.



Figure 82. --Team Formed in Column.

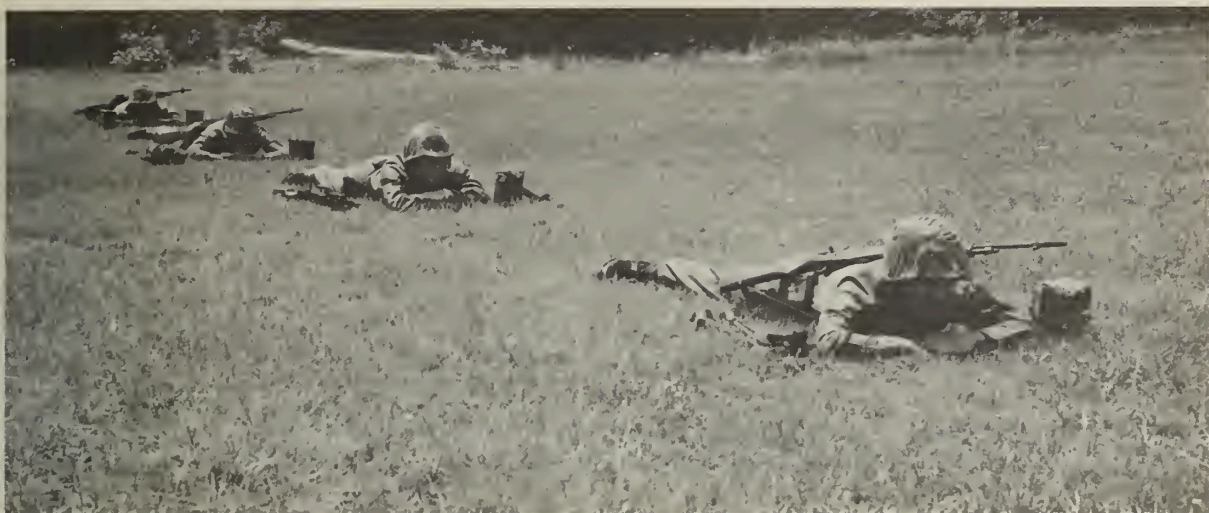


Figure 83. --Team in Prone Position.

82.) The team members assume the prone position, ready for team training. (See fig. 83.)

c. Examination of Equipment. --A thorough examination of equipment is made before each exercise. After the team is formed, the squad leader commands EXAMINE EQUIPMENT. At this command, each team member examines his equipment as explained below.

(1) Examination by Team Leader

(a) The team leader examines his ammunition first. To do so, he releases the cloth flaps and pulls out the cardboard flaps. He ensures that the ammunition is properly linked, free of dirt and corrosion, and that the double link is up ready for loading. Ammunition belts should not be removed from the bandoleers for examination. After he examines the ammunition, he reinserts the cardboard flaps in the bandoleer and fastens the cloth cover. He places the ammunition to his left.

(b) The team leader then examines the tripod. He ensures that the legs are folded closely together and, with his right hand, checks the sleeve latch to ensure that it has spring tension and will function. This completes his examination of equipment.

(2) Examination by Gunner

(a) Remaining in the prone position, the gunner first examines his ammunition as did the team leader.

(b) The gunner then examines his gun. He pulls the bolt to the rear, places the safety on "S", raises the feedcover, and checks the chamber to ensure that the gun is clear. He crawls forward to the front of the gun and looks through the barrel to ensure that the bore is clean. He checks the bleeder hole of the gas cylinder extension to ensure that it is clear. The gunner then checks the flash suppressor for cracks and the front sight for tightness and damage to the blade. Next, he checks the gas cylinder extension, gas port plug, and gas cylinder nut for tightness. He uses the combination wrench to tighten them if necessary, and passes the wrench to the number one ammunition bearer. He moves the carrying handle so that it will not interfere with aiming or firing. He ensures that the barrel locking lever is down. He then moves to the rear of the gun and examines the feedcover assembly. He ensures that the feed cam is clean and properly lubricated, pushing it back and forth to check for free functioning. He pushes on the belt feed pawl to ensure that it has spring tension. He does the same to the cartridge guides and the belt holding pawl. He checks the feedplate to ensure that the feed rollers are free and will rotate. He lowers and latches the feedcover, places the safety on "F", and pulls the trigger, allowing the bolt to go forward. He sets the rear sight on 300 meters and zero deflection and lowers the sight. (See figs. 84 and 85.)



Figure 84. --Gunner Inspecting Chamber.



Figure 85. --Gunner Checking Barrel Group.

(c) The gunner next checks the gun platform and pintle. He checks the pintle and the platform retainer, leaving the retainer in the raised position. This completes the gunner's examination of equipment. He assumes his position parallel to the gun with his head on line with the feedway.

(3) Examination by Number One Ammunition Bearer

(a) Remaining in the prone position, the first ammunition bearer begins by examining the ammunition as did the team leader.

(b) He then opens the spare barrel case and removes the traversing and elevating mechanism. (See fig. 86.) He centers the



Figure 86. --Inspecting the Traversing and Elevating Mechanism.

elevating handwheel so that about 1-1/2 inches of thread is exposed above and below the handwheel. He then centers the offset head. He checks the tripod plate lock pin on the rear elevation adapter to ensure that it functions and has spring tension. He then places the traversing and elevating mechanism on his ammunition box.

(c) The first ammunition bearer removes the spare barrel from its case and performs the same checks listed for the gunner. He also checks the barrel socket to ensure its cleanliness.

(d) The first ammunition bearer has completed his examination of equipment when he returns the spare barrel to its case, replaces the traversing and elevating mechanism, and closes the case. He checks the accessory pocket to ensure the required equipment is present.

(4) Examination by Number Two Ammunition Bearer. --The second ammunition bearer examines his ammunition as did the team leader.

(5) Report of Examination. --Upon completion of the examination of equipment, discrepancies that cannot be corrected by the individual team member will be reported to the squad leader. Each team member reports as follows:

(a) Number two ammunition bearer: NUMBER TWO AMMUNITION BEARER CORRECT.

(b) Number one ammunition bearer: AMMUNITION BEARERS CORRECT.

(c) Gunner: AMMUNITION BEARERS AND GUNNER CORRECT.

(d) Team leader: ALL CORRECT.

2203. ACTION

a. To place the gun in action, the squad leader indicates the point where the gun is to be mounted and the general direction of fire. He commands and signals: GUN TO BE MOUNTED HERE, FRONT, ACTION/GUNS, THIS LINE, FRONT, ACTION. (See fig. 87.)



Figure 87. --Action - Indicating Position of Gun.



Figure 88. --Action - Team Leader Moving to Position.

b. At the command ACTION, the team leader rises to his feet, grasps the right leg of the trip near the tripod head with his right hand, and grasps the ammunition box with his left hand. He rotates the tripod onto his right hip, left leg up, and moves forward to the gun position. (See fig. 88.)

c. On arrival at the gun position, the team leader places his ammunition to his front so that it will be approximately on line with the tripod head when the tripod is opened. He kneels on his right knee and rests the shoes of both legs on the ground with the mount in a vertical position. Steadying the mount with his right hand near the tripod head, he raises the front leg with his left hand. He grasps the right leg shoe with his right hand, the left leg shoe with his left hand, and raises the tripod to a vertical position, chest high. He separates the tripod legs with a quick jerk, ensuring that the sleeve latch engages the sleeve. (See fig. 89.) He places the tripod on the ground with the front leg pointing in the direction of fire. He rises to his feet and stamps the rear leg shoes into the ground. He then assumes a prone position on his left hip at the left of the tripod.

d. The first ammunition bearer times himself to arrive at the gun position at the time the team leader assumes his position. He rises, takes the spare barrel case by the handle with his left hand and the ammunition box with his right hand, and moves forward to the left of the gun position. On arrival at the gun position, he places the spare barrel case approximately on line with the muzzle of the gun when it is mounted, and places the ammunition box one pace to his left and on line with the spare barrel case. He opens the spare barrel case, removes the traversing and elevating mechanism, and hands it to the team leader. He takes the spare barrel and puts it on top of the case with the sight toward the gun. He then turns to his left and moves back to this original position. (See fig. 90.)

e. The second ammunition bearer times himself to arrive at the gun position just after the first ammunition bearer leaves. He places his two boxes of ammunition to the left of the ammunition which is on position, turns to his left, and returns to his original position.

f. The gunner times himself to arrive at the gun position as the team leader receives the traversing and elevating mechanism from the first ammunition bearer. He rises to his feet, grasps the carrying handle



Figure 89. --Action - Team Leader Opening Tripod.

in his right hand and his bandoleer of ammunition in his left hand. He moves forward to the gun position and places his ammunition to the left of the tripod. He lowers the pintle into the pintle well of the tripod and locks it in place. The gunner positions the carrying handle so that it will not interfere with aiming, raises the rear sight, and assumes the prone position. The gunner moves his head to the right and swings the rear of the gun up and to his left. The team leader hands him the traversing and



Figure 90. --Action - First Ammunition Bearer.

elevating mechanism and steadies the rear of the gun while the gunner positions the traversing and elevating mechanism, locking it to the gun and on the zero graduation of the traversing bar. (See figs. 91 and 92.) When



Figure 91. --Action - Gunner Mounting the Gun.



Figure 92. --Action - Gunner Placing Traversing and Elevating Mechanism on Gun.

ready to fire, the gunner reports UP to the team leader who, in turn, reports UP to the squad leader. (Live ammunition is NOT loaded in gun drill.)

2204. BARREL CHANGE

- a. When the team leader has reported UP, the squad leader commands CHANGE BARREL.
- b. The gunner pulls the cocking lever handle to the rear and returns it to the forward position. He places the safety on "S" and raises the barrel locking lever with his right hand, keeping his hand on the barrel locking lever throughout the barrel change. (See fig. 93.)
- c. With the asbestos mitten on his left hand, the team leader grasps the bipod legs and removes the barrel from the machinegun. He places it on the deck to the left of the spare barrel case. The team leader grasps the spare barrel by the bipod legs and inserts it into the gun.



Figure 93. --Action - Changing Barrels.

d. The gunner lowers the barrel locking lever, places the safety on "F", and reassumes his firing position.

2205. OUT OF ACTION

a. At the squad leader's command OUT OF ACTION, the gunner raises the feedcover and inspects the receiver and chamber to ensure they are clear, closes the feedcover, pulls the trigger, and places the safety on "S". The team leader secures his ammunition. (See fig. 94.)



Figure 94. --Out of Action - Gunner Checking Chamber.



Figure 95.--Out of Action - Removing Traversing and Elevating Mechanism.

b. The gunner unlocks the slide and raises it from the traversing bar. Supporting the gun with his left hand, he moves his head to the right, and elevates the rear of the gun. The team leader removes the traversing and elevating mechanism. The number one ammunition bearer times himself to arrive at the gun position as the team leader removes the traversing and elevating mechanism. (See fig. 95.)

c. The number one ammunition bearer places the spare barrel in its case, receives the traversing and elevating mechanism from the team leader, and places it in the spare barrel case. He closes the spare barrel case, grasps it with his right hand and the ammunition box with his left hand, and returns to his original position. (See fig. 96.)

d. The gunner moves the rear of the gun to the right, unlocks the pintle from the tripod, and rises to his feet. He lowers the rear sight, grasps the carrying handle with his right hand, and raises the gun,



Figure 96. --Out of Action - First Ammunition Bearer.

disengaging the pintle from the tripod. Grasping his ammunition with his left hand, he pivots to his right, and returns to his original position. (See fig. 97.)

e. The number two ammunition bearer moves to the left of the gunner, picks up his ammunition, and returns to his original position.

f. The team leader rises, grasps the tripod near its head, and rotates it up onto his right hip so that the left tripod leg is uppermost. He grasps his ammunition with his left hand, turns to his left, and returns to his original position. (See fig. 98.) On reaching his position, he places his ammunition on the deck and drops to his right knee. He places the tripod in a vertical position with the rear shoes on the deck, supporting the tripod with his right hand near its head. He reaches up with his left hand and lowers the front leg. Sliding his right hand down the right leg of the tripod, he releases the traversing bar sleeve latch. He grasps the



Figure 97. --Out of Action - Gunner.



Figure 98. --Out of Action - Team Leader.

left leg near the shoe with his left hand and closes it to the right. He lowers the tripod to the deck with its head to the front and assumes the prone position, reporting UP.

2206. ROTATION

a. Duties are rotated during gun drill to ensure that all member of the team can perform all duties within the team.

b. To rotate duties, the squad leader commands **FALL OUT SQUAD LEADER**. At this command, each member of the team moves to the right of the equipment and assumes a new duty. The squad leader becomes number two ammunition bearer; the team leader becomes squad leader; the gunner becomes team leader; the number one ammunition bearer becomes gunner; the number two ammunition bearer becomes number one ammunition bearer. If it is not desired to rotate squad leader the command is **FALL OUT TEAM LEADER**. At this command, the team members rise and move up one position, as above. When the team members assume their new positions, they call out their new duties in order, **NUMBER TWO AMMUNITION BEARER; NUMBER ONE AMMUNITION BEARER; GUNNER; TEAM LEADER; SQUAD LEADER**.

Section III. QUALIFICATION FIRING

2301. GENERAL

After machinegunners become proficient in mechanical training and gun drill, they fire the 12.7 meter qualification course. Machinegunners learn the fundamentals of marksmanship, their position and grip, 12.7 meter zeroing, and become familiar with the operation and noise of the M60 during firing. Qualifying on the 12.7 meter course instills confidence in the gunners in themselves and their machineguns.

2302. FUNDAMENTALS OF MARKSMANSHIP

a. Accurate Initial Burst. --Obtaining an accurate initial burst of fire on the target is fundamental to good marksmanship. This is accomplished by estimating the range to the target correctly; by correctly setting the sights on the machinegun; and by properly laying the gun with the traversing and elevating mechanism. After the estimated range has been set on the rear sight, the machinegun is manipulated until the line of sight intersects the target at its center base.

b. Adjustment of Fire. --Adjustment of fire is the second fundamental of good marksmanship. The team leader and the gunner observe the strike of the bullets when the initial burst is being fired. If it is not on target, the gun is manipulated until the bullets hit the target.

c. Mechanical Skill in Manipulation. --Mechanical skill in manipulation is required to engage targets that have depth or width. Skill in the use of the traversing and elevating mechanism will be gained from practice. When both traverse and search are necessary, the traverse is accomplished first. One click of either the traversing or elevating handwheel moves the muzzle of the gun one mil. To traverse the weapon, the gunner places his left hand on the traversing handwheel with his thumb uppermost. To move the barrel of the machinegun to the right, the gunner pushes his thumb up and away from himself. To move the gun to the left, he pulls his hand down. Having traversed the gun, the gunner moves his left hand to the elevating handwheel, placing it on top of the handwheel with his thumb to the rear. In order to elevate the weapon, the gunner turns the handwheel counterclockwise, moving his thumb to the right. To depress the gun, the gunner turns the handwheel clockwise, pulling his thumb back toward

himself. Proper mechanical manipulation of the machinegun may be remembered by the phrases PUSH RIGHT UP, PULL LEFT DOWN.

d. Speed. -- Speed is the fourth fundamental of good marksmanship. It is attained by practice and a thorough understanding of the other fundamentals of machinegun marksmanship. Speed should not be stressed to the detriment of accuracy, adjustment, or skill in manipulation.

2303. POSITION AND GRIP

a. Gunner

(1) The gunner is in a prone position to the rear of the gun with his right shoulder against the butt stock group. A straight line extending through the barrel and receiver passes through his right shoulder and hip. His legs are comfortably spread and his heels are down (if possible).

(2) The gunner's left hand grasps the elevating handwheel, palm down. His right hand is on the grip with his index finger on the trigger. The gunner exerts a firm pressure to the rear with both hands while aiming and firing. His cheek rests against the feedcover. He does not attempt to apply cross pressure to the gun because it is extremely difficult to apply the same way twice. Breath control is practiced during aiming and firing.

b. Team Leader. -- The team leader assumes a prone position on his left side to the left of the gun. His head and eyes are even with the feedway. He loads, unloads, and changes barrels from his position.

2304. 12.7 METER ZEROING

a. Sight Alignment. -- To correctly align the sights of the M60 machinegun, the front sight blade is centered vertically in the aperture of the rear sight slide. The top of the front sight blade is even with the top of the rear sight slide. (See fig. 99.)

b. Sight Picture. -- With the sights properly aligned, the gunner takes a six o'clock sight picture. The target is centered on the front sight blade with the bottom of the target even with the top of the rear sight slide. (See fig. 100.)



Figure 99. --Correct Sight Alignment.

c. Zeroing. --Before firing the 12.7 meter course for record, the gun must be zeroed. To accomplish this, two solid black pasters are placed on the standard 12.7 meter (500 inch) target. The paster between numbers one and two is the zeroing paster. The other solid black paster is located between numbers three and four. It is the confirming paster. (See fig. 101.)

(1) The gunner sets a range of 500 meters on his rear sight and aligns the zero index on the rear sight leaf with that on the sight base. He assumes the correct position behind the gun and aims at the zeroing paster, firing a six round belt.

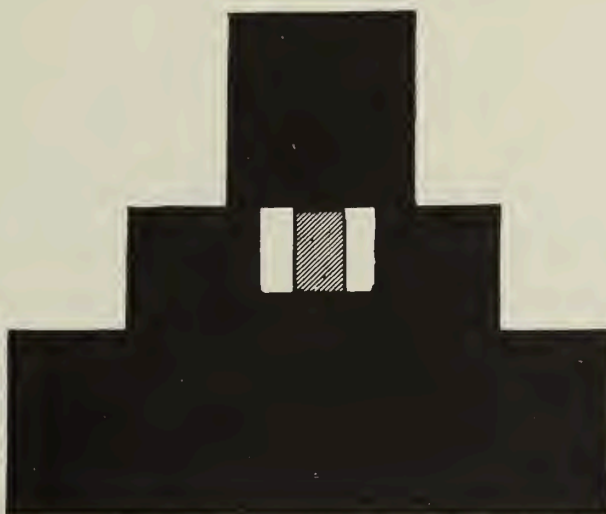


Figure 100. --Correct Sight Picture.

(2) The gunner then executes clear gun and moves forward of the firing line. He places a black paster on the target so that the center base of the paster is at the center of a shot group. He returns to his gun, resumes his position, and takes the same sight picture that he had before firing.

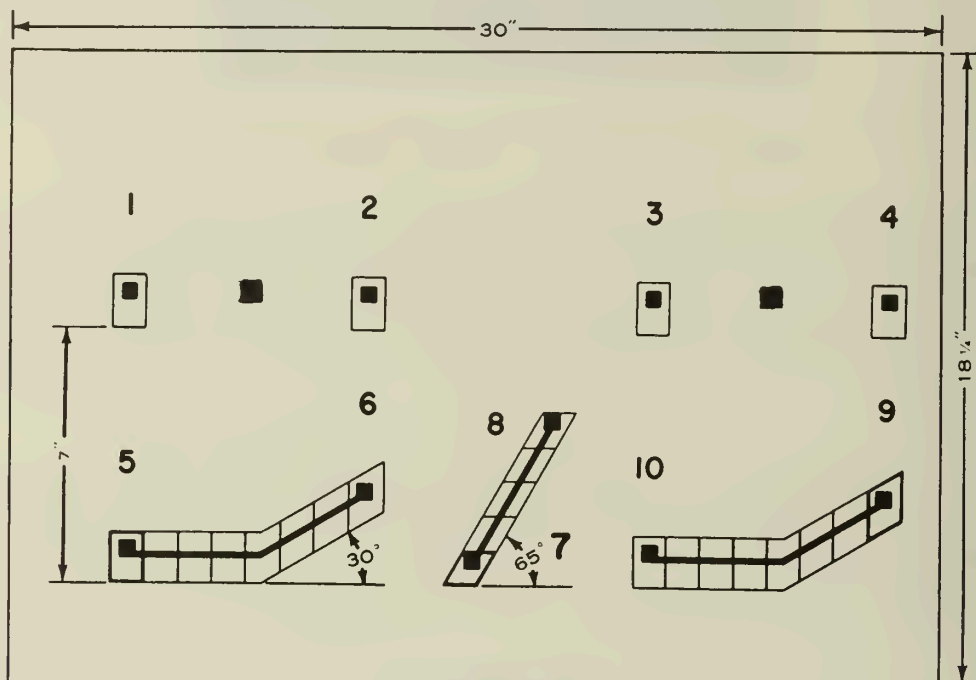


Figure 101. --12.7 Meter Target.

(3) While the gunner holds his position, the team leader manipulates the rear sight. Since one click of the traverse knob is one mil, one click will move the sight picture half an inch at a range of 500 inches. One click of the elevating knob is one quarter of a mil. Therefore, one click at 500 inches will move the sight picture an eighth of an inch. The team leader manipulates the sight until the gunners sight picture is at six o'clock on the paster centered on the shot group. When this has been accomplished, the point of aim coincides with the strike of the bullets.

(4) The team leader then lowers the rear sight. Using the combination wrench, he loosens the range plate screw and moves the adjustable range plate up or down until the 500 meter reading is again on the rear sight. The machinegun is then zeroed.

(5) The gunner then manipulates the gun until he is aimed at the confirming paster. He fires a six round belt to confirm the zero of his gun. If the shot group is not on target, the team leader again manipulates the rear sight until the sight picture is on the center of the shot group.

2305. 12.7 METER FIRING

a. Pastors one through four are fixed fire pastors. A six round belt is loaded and fired at each fixed fire pastor. To engage these pastors, the following commands are given:

WITH A SIX ROUND BELT, LOAD
PASTER NUMBER ONE (TWO, THREE, OR FOUR)
FIVE HUNDRED
FIXED
SIX ROUND BURST
AT MY COMMAND
FIRE

b. Pastors five to six require manipulation of the machinegun. A 48 round belt is loaded and fired at these pastors. The gunner aims at pastor five and fires his initial six round burst. He traverses two clicks right after each of the first four six round bursts. The next three squares require two clicks right and one click up after each six round burst. To engage pastors five to six, the following fire command is given:

WITH A FOUR EIGHT ROUND BELT, LOAD
PASTER NUMBER FIVE
FIVE HUNDRED
TRAVERSE AND SEARCH
SIX ROUND BURSTS
AT MY COMMAND
FIRE

c. A thirty round belt is loaded and fired at pastors seven and eight. A total of four manipulations are required. The gunner traverses one click right and elevates two clicks after each six round burst. The fire command is:

WITH A THREE ZERO ROUND BELT, LOAD
PASTER NUMBER SEVEN

FIVE HUNDRED
TRAVERSE AND SEARCH
SIX ROUND BURSTS
AT MY COMMAND
FIRE

d. Pasters nine to ten are the opposite of pasters five to six. The manipulation required is two clicks left and one click down, three times; then two clicks left, four times. The fire command is:

WITH A FOUR EIGHT ROUND BELT, LOAD
PASTER NUMBER NINE
FIVE HUNDRED
TRAVERSE AND SEARCH
SIX ROUND BURSTS
AT MY COMMAND
FIRE

2306. 12.7 METER SCORING

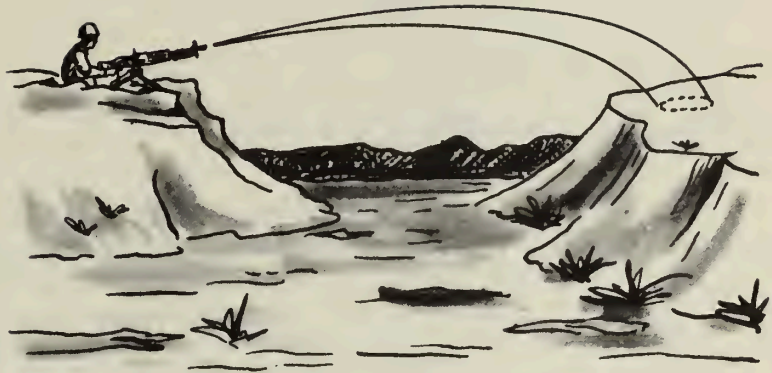
There is a total of 150 rounds fired over the 12.7 meter qualification course. A bonus of two points is awarded for hitting any scoring square. One point is scored for each bullet hole in a scoring square up to a total of six holes. Thus a gunner may receive a maximum of eight points per square, two bonus points and six points for six hits. A bullet hole on the line between two squares may be counted in either square, but

12.7 METER MACHINEGUN QUALIFICATION RECORD			
RANK	NAME	SER NO.	
UNIT	TARGET NO.	DATE	
1	5 to 6		EXPERT: 150-200
2	7 to 8		1st CLASS: 130-149
3	9 to 10		2nd CLASS: 105-129
			UNQUALIFIED: Zero-104
4	Total	QUAL	SCORER

Figure 102. -- 12.7 Meter Machinegun Qualification Record.

not in both squares. It should be scored in the square which will give the gunner the higher score. Pasters one through four may receive a possible score of eight points each. Pasters five to six may receive 64 points, as may pasters nine to ten. Pasters seven to eight may receive 40 points. The total possible score for the 12.7 meter course is 200 points. Figure 102 may be locally reproduced to record 12.7 meter qualification scores. The following classifications may be achieved by machinegunners:

<u>SCORE</u>	<u>CLASSIFICATION</u>
150 and over-----	Expert Gunner
130 through 149 -----	First Class Gunner
105 through 129 -----	Second Class Gunner
104 and below-----	Unqualified



CHAPTER 3

TECHNIQUE OF FIRE

Section I. GENERAL

3101. GENERAL

Technique of fire is the application of those methods and principles necessary to engage and destroy targets with a minimum expenditure of time and ammunition. Technique of fire includes:

- a. Characteristics of fire.
- b. Classes of fire.
- c. Range determination.
- d. Field zeroing.
- e. Fire control.

- f. Fire commands.
- g. Target engagement.
- h. Employment.

3102. CHARACTERISTICS OF FIRE

a. Trajectory. --The trajectory is the path of the bullet. It begins when the round is fired and ends when the bullet strikes the target or the ground. The trajectory is curved and its curvature increases with the range. (See fig. 103.)

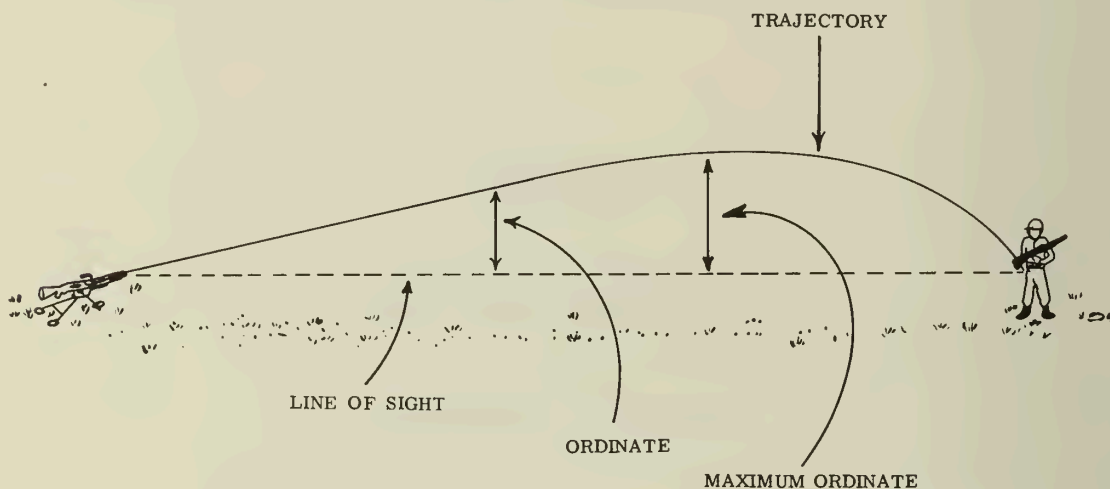


Figure 103. --Characteristics of Fire.

b. Line of Sight. --The line of sight is an imaginary straight line between the center of the chamber and the target. (See fig. 103.)

c. Ordinate. --Ordinate is defined as the shortest distance between any point on the trajectory and the line of sight. With the M60 machinegun, the ordinate increases for about two-thirds of the distance to the target and decreases for the remaining third. (See fig. 103.)

d. Maximum Ordinate. --The maximum ordinate occurs at approximately two-thirds of the range to the target. At short ranges, the maximum ordinate is very short. It increases rapidly at ranges over 1,000 meters. (See fig. 103.)

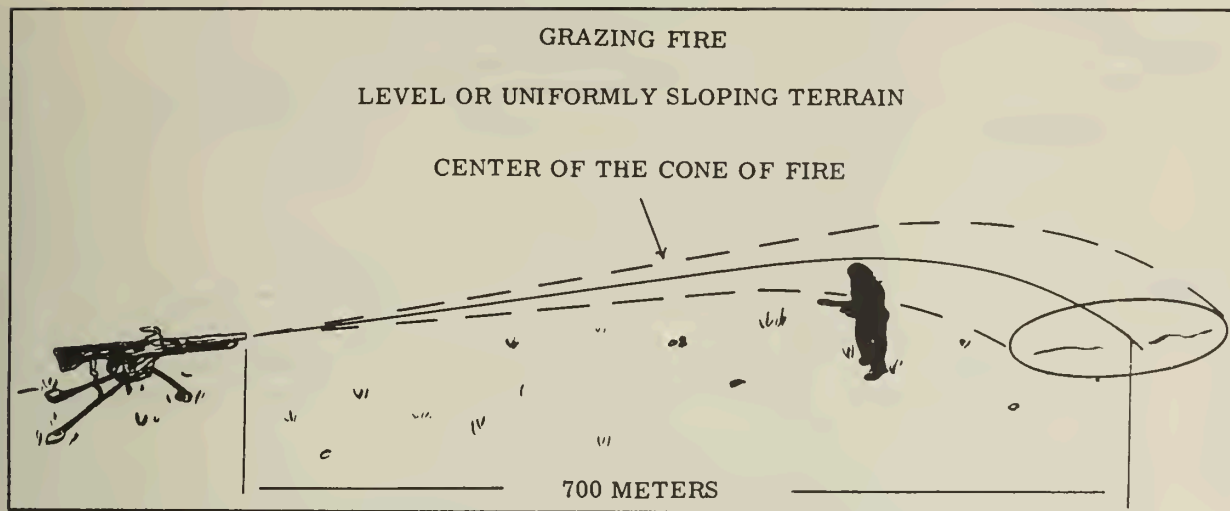


Figure 104. --Grazing Fire.

e. Cone of Fire. --All the bullets in a burst of fire do not follow the same path. The vibrations of the gun and mount, variations in ammunition, and atmospheric conditions combine to cause each trajectory to differ slightly from the others in that burst. The group of trajectories in a single burst is called the cone of fire. (See fig. 104.)

f. Beaten Zone. --As the cone of fire strikes the ground, an elliptical pattern is formed. This is called the beaten zone. The center of the beaten zone is called the center of impact. The gunner is not required to know the exact lengths and widths of beaten zones. However, he should know that as the range to the target increases, the beaten zone becomes shorter and wider. The slope of the terrain will affect the length of the beaten zone but will not affect its width. The width of the beaten zone is a constant two mils wide at all ranges. A mil is an angle. There are 6,400 mils in a circle. For practical use, a mil may be defined as the angle which at a distance of one thousand units is subtended by a chord approximately one unit wide. Substituting meters for units, it would be one meter wide at a distance of 1,000 meters. Using this definition, the width of the beaten zone in meters can be determined for any range by simply multiplying two mils by the range expressed in thousands of meters. For example, to determine the width of the beaten zone in meters at a range of 1,000 meters, multiply two (mils) times one (range in thousands of meters) equals two (width of the beaten zone in meters). (See fig. 105.)

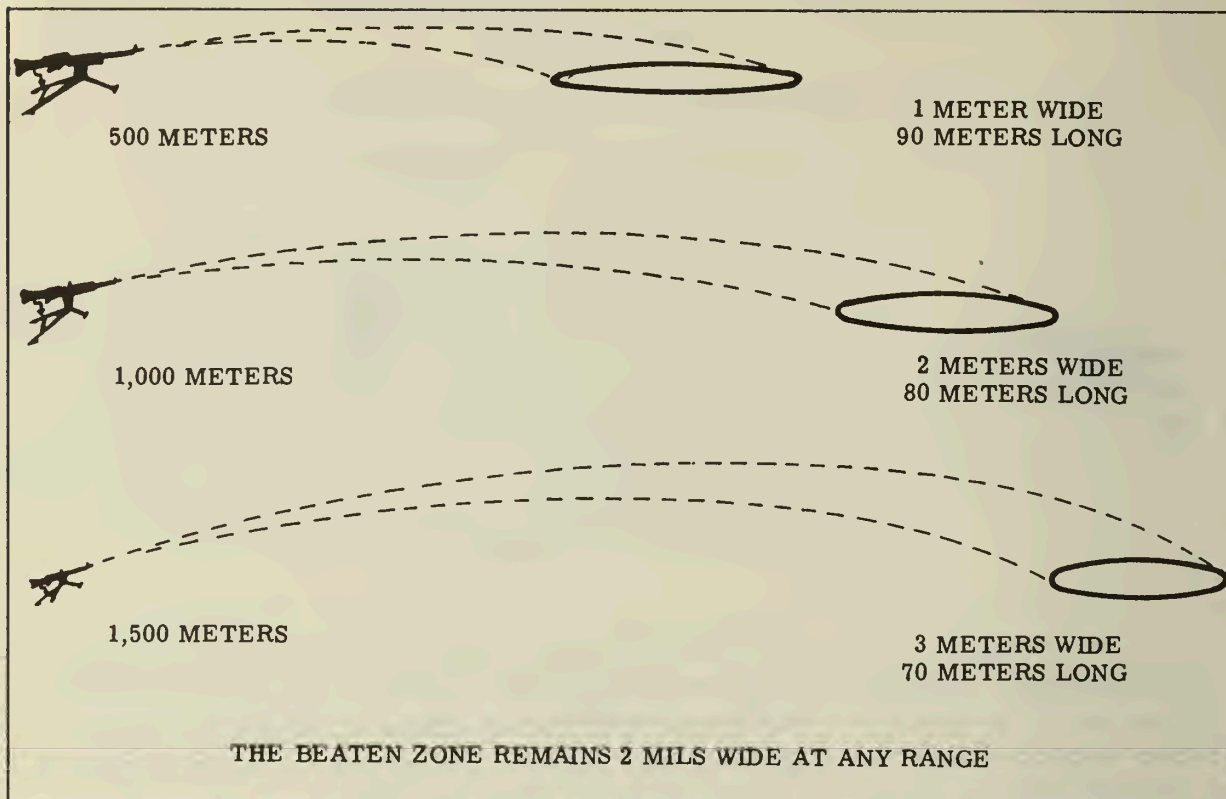


Figure 105. --Beaten Zones at Various Ranges.

3103. CLASSES OF FIRE

Machinegun fire is classified with respect to three factors which influence it. Fire with respect to the ground, gun, and target are each discussed in detail.

a. Fire With Respect to the Ground

(1) Grazing Fire. --Grazing fire is defined as fire in which the center of cone of fire does not rise above the height of a man standing; approximately six feet. Over level or uniformly sloping terrain, the M60 will deliver grazing fire up to 700 meters range. Danger space is that area where a man cannot safely stand. An average sized man standing anywhere along the gun target line will be struck by a round when grazing fire is being delivered. (See fig. 104.)

(2) Plunging Fire. --Plunging fire is fire in which the danger space is practically confined to the beaten zone. Plunging fire is obtained when firing from high ground to low ground, when firing into abruptly rising ground, and when firing at long ranges. (See fig. 106.)

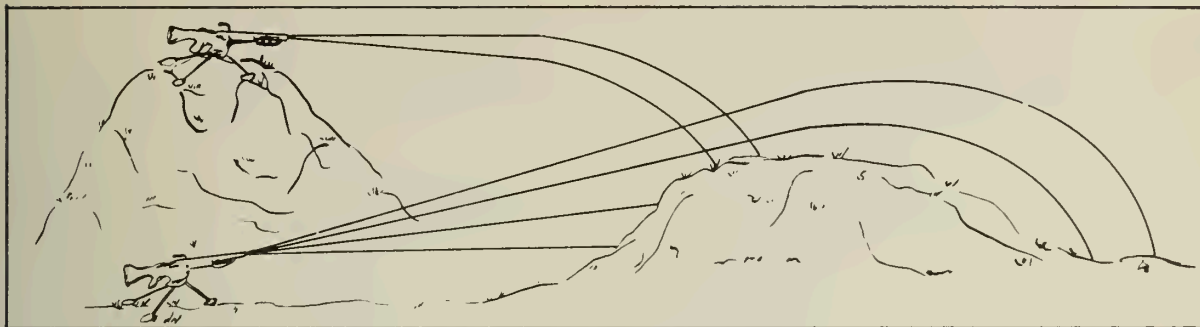


Figure 106. --Plunging Fire.

b. Fire With Respect to the Gun. --Fire is classified with respect to the gun according to the type of manipulation required to deliver it.

(1) Fixed Fire. --Fixed fire is delivered when no manipulation of the gun is required. It is delivered against point targets. When delivering fixed fire, the beaten zone is sufficient in both length and width to cover the target.

(2) Traversing Fire. --Traversing fire is delivered when the beaten zone is not wide enough to cover the target. It is delivered against wide targets. The gun is manipulated in direction across the target.

(3) Searching Fire. --Searching fire is delivered when the beaten zone is not long enough to cover the target. It is delivered against deep targets. The gun is manipulated in elevation up and down the target.

(4) Traversing and Searching Fire. --Traversing and searching fire is delivered when the beaten zone is neither wide enough nor long enough to cover the target. It is delivered against oblique targets. The gun is manipulated in both direction and elevation.

(5) Swinging Traverse. --Swinging traverse is fire delivered against targets requiring rapid, major changes in direction and maximum fire. It is delivered at the cyclic rate of fire. Complete target coverage is not ensured since the gun is moving during firing and beaten zones will not be tangent.

(6) Free Gun. --A free gun is used to deliver fire against targets requiring rapid, major changes in both direction and elevation, such as an aerial target or a target moving rapidly across the front over uneven terrain. It is fired at the cyclic rate of fire.

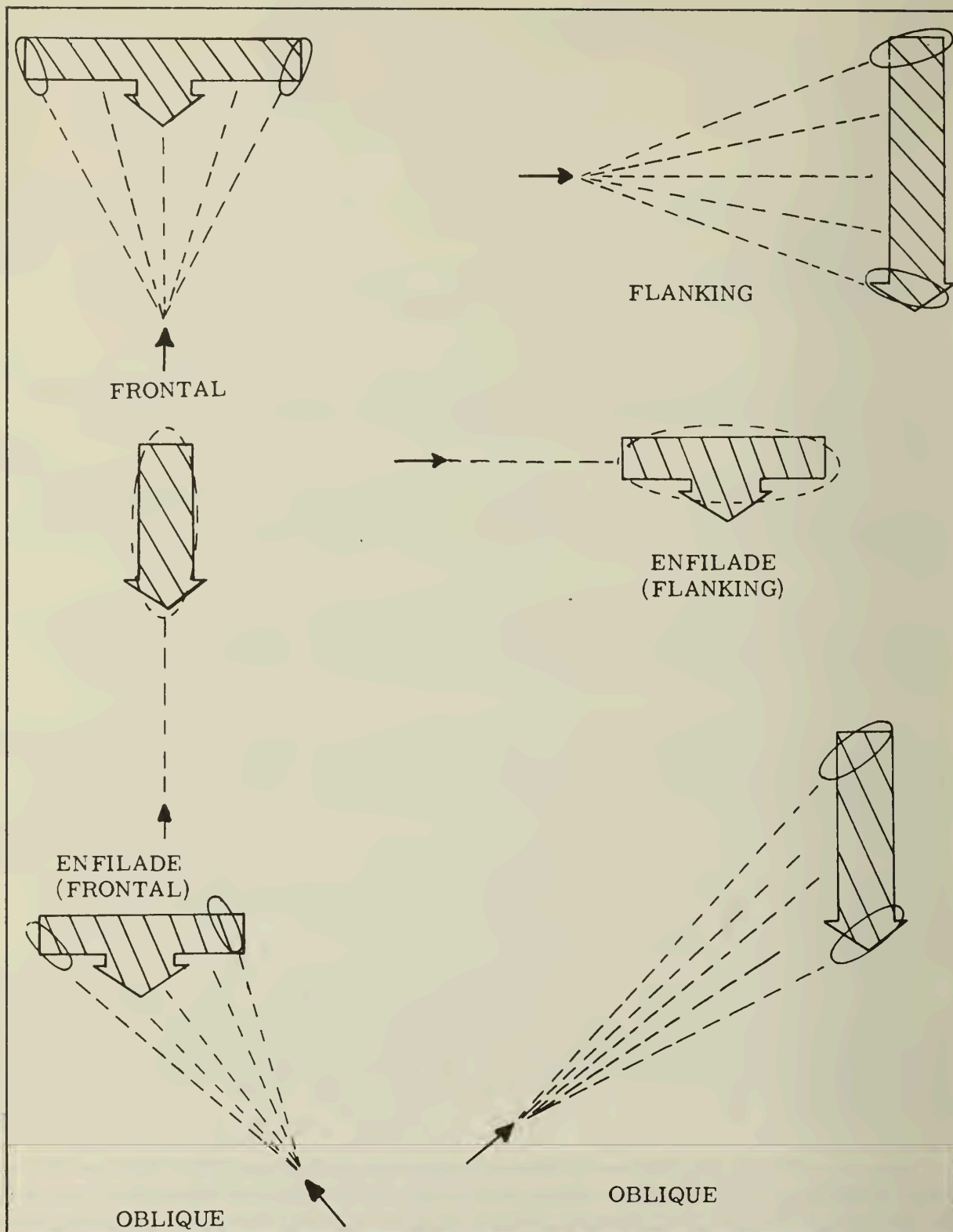


Figure 107. --Classes of Fire With Respect to the Target.

c. Fire With Respect to the Target. --There are four classes of fire with respect to the target. (See fig. 107.)

(1) Frontal Fire. --Frontal fire is fire delivered at a right angle to the front of the target.

(2) Flanking Fire. --Flanking fire is fire delivered against the flank of a target.

(3) Oblique Fire. --Oblique fire is fire obtained when the long axis of the beaten zone is at an oblique angle to the long axis of the target.

(4) Enfilade Fire. --Enfilade fire is fire obtained when the long axis of the beaten zone coincides with the long axis of the target.

3104. RANGE DETERMINATION

Range determination is an important part of a machinegunner's training. Being able to accurately determine range enables a gunner to get his initial burst on the target, thereby gaining maximum effect before the enemy can take cover and return fire. Range is determined to the nearest 50 meters. The methods used to determine range are listed below:

a. Estimating By Eye. --The most frequently used method of determining range is estimating by eye. This method requires considerable practice before the desired proficiency is obtained. There are two basic methods used in estimating range by eye.

(1) Mental Unit of Measure Method. --The object of this method is for the individual to picture a specific distance. By applying this distance unit as a mental yardstick from the gun to the target, he is able to determine the range to the target. Most Marines are familiar with the 100-yard football field and this mental unit is most commonly used. Since the meter has replaced the yard as the standard unit of measure for machinegunners, the gunner must visualize a distance of 100 meters which is slightly longer than 100 yards (100 meters is approximately 110 yards). If the range to the target appears to be greater than 500 meters, it is best to estimate the range to the mid-point and simply double it for the range to the target. Situation permitting, have two or three other men estimate the range to the target and then average the estimates.

Factors to be considered in estimating range by eye.	Objects appear NEARER than they really are: Range underestimated.	Objects appear MORE DISTANT than they really are: Range overestimated.
The target-its clearness of outline and details	When most of the target is visible and offers a clear outline	When only a small part of the target may be seen or is small in relation to its surroundings
Nature of the terrain or position of the observer.	When looking across a depression, most of which is hidden from view. When looking downward from high ground.	When looking across a depression, all of which is visible. When looking from low ground toward high ground. When vision is narrowly confined as in twisted streets, draws, or forest trails.
	When looking down a straight open road or along a railroad track.	In poor light such as dawn and dusk, in rain, snow, or fog, or when the sun is in the observer's eyes. When the target blends into the background or terrain.
	When looking over uniform surfaces like water, snow, desert, or grain fields.	
Light and atmosphere	In bright light or when the sun is shining from behind the observer. When the target is in sharp contrast with the background, or is silhouetted, by reason of size, shape, or color. When seen in the clear atmosphere of high altitudes.	

Figure 108.--Factors Affecting Estimation of Ranges By Eye.

(2) Appearance of Familiar Objects Method. --The object of this method is for the individual to remember how large a man or piece of equipment looks at various ranges. This method is used in conjunction with the mental unit of measure method to accurately estimate the range to the target. For a list of factors affecting estimation of range by eye, see figure 108.

b. Firing the Gun. --In order to determine range by firing the gun, the gun must first be zeroed (see par. 3105). The gunner opens fire at a terrain feature and manipulates the gun until his rounds are striking

properly. Without disturbing the lay of the gun, the gunner then manipulates the rear sight until he has his sight picture on the terrain feature. He then notes the range reading on the rear sight and records it as the range to the terrain feature.

c. Map or Aerial Photograph. --Range may be determined from maps or aerial photographs provided the scale and the gun position are known. When a target appears near a known terrain feature, the gunner uses the range to the terrain feature as the basis for estimating the range to the target.

d. Stepping Off the Distance. --In a defensive situation, time permitting, the gunner may determine range by stepping off the distance to a probable target. He simply walks to the terrain feature and back, counting his paces in both directions. He divides by two to determine the range.

e. Data From Other Units. --When moving into positions occupied by other units, their range cards provide a ready source of information on known and suspected targets. Marine units occupying an area will habitually know the ranges to targets within their sectors of fire.

3105. FIELD ZEROING

Field zeroing is the process by which the line of aim is adjusted to coincide with the strike of the bullets at a given range. A previously zeroed machinegun is essential in order to achieve an accurate initial burst of fire on the target.

a. Bipod Mounted Gun

(1) The gunner sets zero windage on the rear sight.

(2) He selects a target and places his estimated range to the target on the rear sight.

(3) The gunner aims at the target, fires a burst, and notes where the bullets strike.

(4) The team leader manipulates the rear sight as directed by the gunner until the gunner has a good sight picture on the center of impact of the burst.

(5) The gunner then aims at the target and fires a confirming burst.

(6) Step (4) above is repeated if necessary until the line of sight and the strike of the bullets coincide.

(7) The gunner places the original range estimate on the rear sight by loosening the adjustable range plate screw and sliding the range plate up or down until the estimated range is aligned with the upper left corner of the rear sight slide. He then tightens the range plate screw.

b. Tripod Mounted Gun

(1) The gunner estimates the range to the target by the most accurate means available and sets this range on the rear sight.

(2) With zero windage on the rear sight, he lays the gun on the center base of the target by manipulating the traversing and elevating mechanism.

(3) The team leader lowers the rear sight and the gunner fires a burst. The gunner looks over the top of the gun to observe the strike of the bullets.

(4) If the burst is not on target, the gunner manipulates the gun until he is hitting the target.

(5) The gunner maintains his position, grip, and pressure, while the team leader raises the rear sight. At the direction of the gunner, the team leader manipulates the sight toward the center of impact. When the gunner has a sight picture on the center base of the target, the team leader lowers the rear sight. The point of aim now coincides with the strike of the bullets.

(6) The team leader loosens the range plate screw and moves the range plate up or down until the original range estimation is on line with the top left edge of the rear sight slide. He then tightens the range plate screw. The gun is field zeroed.

3106. FIRE CONTROL

Fire control includes all operations of the machinegun unit leader that are connected with the preparation and actual application of effective fire on a target. It requires the ability of the machinegun unit leader to select and designate targets for the appropriate gun(s), open fire at the instant he desires, adjust the fire of his gun(s), regulate the rate of fire, shift from one target to another, and cease firing. Ability to exercise fire control depends primarily on the discipline and training of the crew. Failure to exercise good fire control results in ineffective employment of the machinegun and is wasteful of time, ammunition, and lives. When possible, machineguns are employed by squad to produce heavy and continuous fire and ensure rapid and complete target coverage.

3107. FIRE COMMANDS

a. General. --Fire commands are the means by which fire control is exercised. Fire commands are the instructions issued to gun crews that enable them to properly engage the desired targets. There are two types of fire commands: initial and subsequent. Initial fire commands are issued to engage targets and to shift fire to new targets. Subsequent fire commands are issued to adjust fire, change the rate of fire, and to cease fire. The explanation below is based on employment of the guns by squad (two machinegun teams). A good fire command is as brief as clarity will permit. It contains all necessary elements given in proper sequence. It is given clearly and at a rate that can be easily understood by the gunners. The gunner repeats each element to ensure understanding. It is most improbable that a complete initial fire command would ever be issued during a fire fight. The leader determines which elements of a fire command are obvious to the gunners and which elements must be given to them. Some targets may necessitate including all elements. Others may be engaged with only the alert, range, and command to fire. For example: FIRE MISSION, SEVEN HUNDRED, FIRE. The procedures outlined below are used to accustom machinegunners to issue and execute instructions in a definite, logical sequence. The use of complete fire commands in training makes this sequence second nature of machinegunners, preparing them for fragmentary fire commands in combat.

b. Initial Fire Commands. --The elements of an initial fire command are:

ALERT

TARGET DESIGNATION

DIRECTION (only when not obvious)

DESCRIPTION (only when not obvious)

RANGE

METHOD OF FIRE (as required)

DIVISION (only when required)

MANIPULATION (only when not obvious)

RATE (only if sustained or cyclic)

COMMAND TO OPEN FIRE

(1) Alert. --The alert is the first element of the initial fire command. Its purpose is to designate the gun crews and ready them to receive and execute the fire command. FIRE MISSION is announced for all targets. When both guns of a squad are to fire, the squad leader announces FIRE MISSION. If only one gun is to fire, then NUMBER ONE, FIRE MISSION or NUMBER TWO, FIRE MISSION is given. When the squad leader desires to alert both guns, but only wants one gun of the squad to fire, he announces FIRE MISSION, NUMBER ONE or FIRE MISSION, NUMBER TWO.

(2) Target Designation. --The leader uses three elements to designate the target: direction, description, and range. These elements may be given by voice, arm-and-hand signals, laying the gun, firing the gun, firing individual weapons, or by any combination of these methods.

(a) Direction. --When the target is not obvious, the gunners must be told to look in a particular direction to see it. Direction is given as FRONT, RIGHT (LEFT) FRONT, RIGHT (LEFT) FLANK, etc. An indistinct target may be indicated by the use of a reference point. The selected reference point must be an easily recognizable terrain feature or object which is in or near the target area. When a reference point is used, it is announced as REFERENCE. For clarity, the word TARGET always precedes the target description when a reference point is used. When the selected reference point is within the target area, the target may be indicated as extending so many mils, meters, or fingers from the reference point. When using this method, the words mils and meters are not given. Mils are always implied for tripod mounted guns and meters are always implied for bipod mounted guns. Examples of the use of reference points within the target area are REFERENCE: BUNKER; TARGET: TROOPS EXTENDING RIGHT TWO FIVE, LEFT TWO FIVE; and REFERENCE: TANK; TARGET: TROOPS EXTENDING SHORT ONE ZERO, OVER TWO

ZERO. If the selected reference point is not within the target area, a typical command would be REFERENCE: LONE TREE, RIGHT FIVE ZERO; TARGET: MACHINEGUN IN EDGE OF WOODS. When a reference point within the target area is used to designate the target, the range announced is that to the reference point. When the reference point is outside the target area, the range to the target is announced. An obscure target may be identified by first designating an obvious feature (reference point) and then leading the gunner, step by step, to the target by naming successive reference points until his attention is directed to the target itself. An example is REFERENCE: RED ROOFED HOUSE, RIGHT OF HOUSE, HEDGE, CENTER OF HEDGE, GATE, ABOVE GATE; TARGET: MACHINEGUN. With a tripod mounted gun, the interval between the reference point and the target is measured by laying the gun on the reference point and manipulating the designated number of mils to the target. With the gun on bipod, the gunner must measure this interval in meter or fingers.

(b) Description. --A target description is a word or two used to inform the gunner of the nature of his target. The following words are examples of target descriptions: TROOPS (any dismounted enemy personnel), MACHINEGUN (any automatic weapon), TANK (any armored vehicle), TRUCK (any unarmored vehicle), ANTITANK (any antitank or artillery piece). If several targets are in view, the particular target, or part of a target, which is to be engaged may be described as LEADING TRUCK, RIGHT BUILDING, FAR END, HALTED COLUMN, etc. If the target is obvious, no description is necessary.

(c) Range. --This element follows the target description and is announced in meters. The words "range" and "meters" are not used. The range is announced in even digits, hundreds, and thousands. For example: THREE HUNDRED, FOUR FIVE ZERO, ONE THOUSAND, ONE ONE HUNDRED.

(d) Other Methods of Designating Targets. --In addition to designating targets orally, the following methods may be used, depending on the situation:

1 Firing. --Designating an indistinct target by firing a machinegun is a simple, rapid, and accurate method. However, it may cause loss of surprise and premature disclosure of the gun position. The leader designating the target announces the general direction of fire if it is not obvious. He then lays one gun on the target and commands WATCH MY

BURSTS. He fires one or more bursts on the target and completes the designation orally; for example: MIDPOINT, RIGHT (LEFT) FLANK, or NEAR (FAR) END. He may fire one burst designating the flanks or ends; he may fire three bursts designating midpoint and flanks or ends. The minimum number of bursts necessary will be used. A similar procedure is used in firing a rifle to designate the target. It is not necessary that the rifle be fired from the gun positions. The use of tracer ammunition will facilitate observation of fire.

2 Laying the Gun. --Laying the gun on a target is a simple and accurate method and does not sacrifice surprise. To use this method, the leader goes to each gun, lays it on the target, and requires the gunners to check the lay. The gunners open fire simultaneously on command of the leader.

(3) Method of Fire

(a) Division. --This element is given only when required and is discussed in detail under engagement of targets. (See sec. II, chap. 3.) It is announced as: NUMBER ONE RIGHT HALF, NUMBER TWO LEFT HALF; or NUMBER ONE RIGHT TWO THIRDS, NUMBER TWO LEFT TWO THIRDS; or NUMBER ONE RIGHT TWO THIRDS, NUMBER TWO LEFT ONE THIRD.

(b) Manipulation. --This element prescribes the class of fire with respect to the gun which is required to effectively engage the target. It is announced as: FIXED, TRAVERSE, SEARCH, TRAVERSE AND SEARCH, SWINGING TRAVERSE, or FREE GUN. This is only given when the required manipulation is not obvious.

(c) Rate. --The greatest surprise and effect is obtained by a pair of guns opening fire simultaneously at the rapid rate of fire. Regardless of the rate of fire announced, gunners always open and adjust their fire at the rapid rate. They use the prescribed rate thereafter. The rate of fire to be used may be sustained, rapid, or cyclic. The factors influencing the selection of the rate of fire are the size and nature of the target and ammunition supply.

1 Sustained. --The sustained rate of fire is 100 rounds per minute. It is fired in bursts of six to eight rounds at 4- to 5-second intervals. A barrel change is required after firing for 10 minutes. It is directed by announcing SUSTAINED.

2 Rapid. --The rate rate of fire is 200 rounds per minute. It is fired in bursts of 10 to 12 rounds at 2- to 3-second intervals. A barrel change is required after firing for two minutes. When the rapid rate is desired, it is not necessary to announce that element.

3 Cyclic. --The cyclic rate is used for swinging traverse and free gun. It is announced as CYCLIC.

(4) Command to Open Fire. --For immediate engagement of the target, the command FIRE or the arm-and-hand signal to fire is given without pause. It is often of great importance that machinegun fire be withheld for surprise and maximum effect, and that both guns of a pair open fire at the same time. To ensure this, the leader may preface the command or signal to commence firing with the words AT MY COMMAND or ON MY SIGNAL. When the gunners are ready to engage the target, they report UP to the team leaders who signal READY to the squad leader, or they may announce NUMBER ONE (TWO) UP. The squad leader then gives the command or signal to fire.

(5) Corrections. --When the gunner is in doubt about any element of the fire command, he repeats the element in question with a rising inflection in his voice. The squad leader then announces THE COMMAND WAS and repeats the element in question. An error in an initial fire command is corrected by announcing CORRECTION and then giving the corrected element. For example: FIRE MISSION, FRONT, TROOPS, FIVE HUNDRED, CORRECTION, SIX HUNDRED, TRAVERSE, AT MY COMMAND.

c. Subsequent Fire Commands. --The subsequent fire command is used by the squad leader to adjust fire, change the rate of fire, cease fire, or terminate the alert.

(1) If the gunner fails to adjust his fire, the squad leader must promptly correct him by announcing or signalling the desired change. When the change is given, the gunner makes the required corrections and continues to engage the target without further command. Changes in direction are given first. For example: RIGHT FOUR or LEFT ONE ZERO. Changes in elevation are given next. For example: ADD FIVE or DROP ONE FIVE. Changes in direction and elevation are always implied as mils for guns on tripod mounts and meters for guns on bipod mounts. The words "mils" and "meters" are not used. Changes for guns on tripod are applied to the

traversing and elevating handwheels. For guns on bipod, these changes are applied by the gunner moving his elbows and/or shifting the position of his body.

(2) Changes in the rate of fire are given orally or by arm-and-hand signals.

(3) An error is corrected by announcing CORRECTION and then repeating the entire corrected subsequent fire command. For example: LEFT FIVE, DROP ONE, CORRECTION: LEFT FIVE, DROP ONE ZERO. This is done to avoid confusion. To interrupt firing, the squad leader announces CEASE FIRE or gives the arm-and-hand signal to cease fire. This keeps the gun crews on the alert and firing can be resumed on the same target by announcing FIRE. To terminate the alert, the squad leader announces CEASE FIRE, END OF MISSION.

Section II. TARGET ENGAGEMENT

3201. GENERAL

The reason for the existence of machineguns and machinegunners is to support the rifleman. They accomplish this purpose by destroying the enemy by fire. Target engagement is the systematic application of machinegun fire to targets of various sizes and shapes. The objective of this system of target engagement is to kill the enemy in the most efficient manner possible. Accordingly, any system of target engagement must have several considerations. Targets must be engaged so as to take advantage of the surprise and casualty producing effect of the initial bursts of fire. Targets must be immediately contained and delimited. The most immediate threat to friendly positions must be eliminated first. Additionally, the distribution and adjustment of fire must be considered.

3202. DISTRIBUTION OF FIRE

a. General. --Machineguns are employed by squads whenever the situation and terrain will permit. The fire of the squad must be distributed over the entire target. Improper distribution of fire results in gaps between beaten zones and incomplete target coverage. Complete target coverage must be ensured even if one machinegun team of the squad should be knocked out. To accomplish this, each gun distributes its fire over the entire target when engaging all but extremely wide targets. To provide faster coverage of such wide targets, those greater than 50 mils in width are usually divided. The method of division is dependent upon the density of the particular target. (See figs. 109 and 110.)

b. Target Density

(1) Equal. --Classic targets of equal density may be skirmish lines, columns, or echelon formations. They are divided in half when their width exceeds 50 mils. The number one gun of a squad is assigned the right half of the target. The number two gun covers the left half. Each gun covers its respective half of the target, with the two beaten zones overlapping at the point of division. (See fig. 110.)

(2) Concentrated. --When the enemy troops comprising a given target are bunched in a portion of that target, the target is of unequal

density. If such a target exceeds 50 mils in width, it should be divided in a manner that will place a greater volume of fire on the greater concentration of troops. An example is a target 60 mils wide with the majority of troops concentrated in the center and just a few on the flanks. This target would be engaged by assigning the number one gun to the right two-thirds and the number two gun to the left two-thirds. Each gun would cover its respective portion of the target with the two beaten zones overlapping the center third of the target. (See fig. 111.)

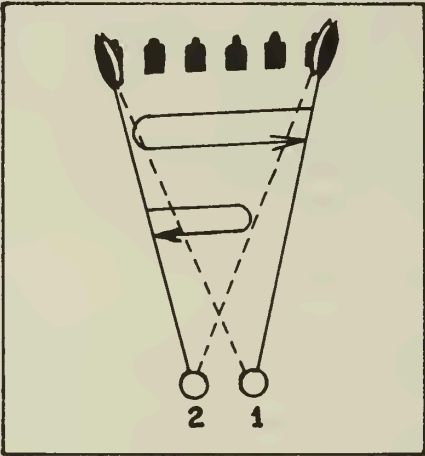


Figure 109. --Engaging a Wide Target Requiring No Division.

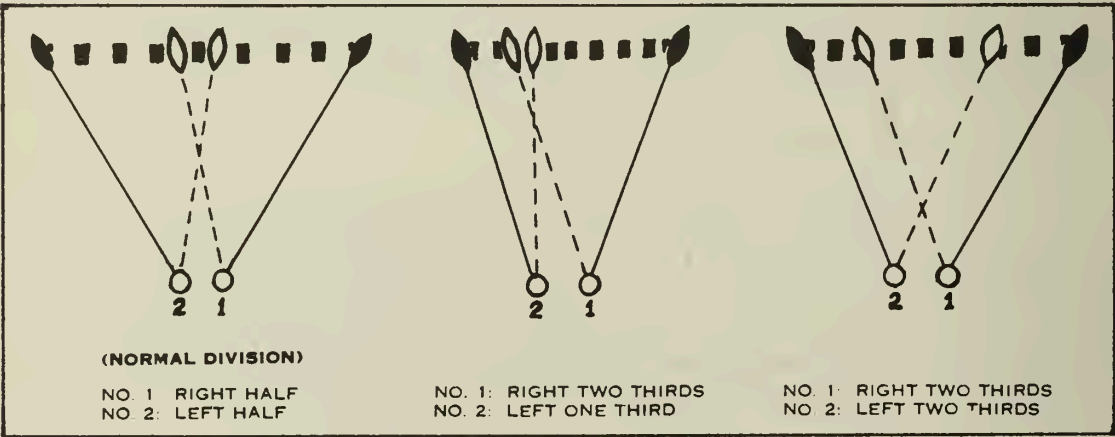


Figure 110.

Figure 111.

Figure 112.

This would produce a double volume of fire on the most densely populated portion of the target. Should the concentration of troops be on the right flank of the target, the number one gun would be assigned the right third while the number two gun covered the left two-thirds. (See fig. 112.) In this manner, the volume of fire on either flank can be doubled.

3203. ADJUSTMENT OF FIRE

Initial bursts of fire are to be delivered with a different aiming point for each gun and adjustments made to deliver effective fire on the target. Adjustment of fire is continued through the fire mission as necessary to deliver fire on the target or targets. Gunners should practice firing of single shots and short bursts to avoid disclosing the gun position.

3204. MANIPULATION OF THE GUN

a. General. --Manipulation is the process of moving the gun between bursts so that fire is properly distributed over the entire target. Proper manipulation is vital to effective target engagement. All manipulations of a tripod mounted gun are accomplished by using the mil click system built into the traversing and elevating handwheels. Manipulations are categorized by the classes of fire with respect to the gun.

b. Fixed Fire. --No manipulation is required.

c. Traversing Fire. --The beaten zone of the machinegun is two mils wide at all ranges. Traversing fire is accomplished in two mil increments so that beaten zones will be tangent to one another ensuring complete target coverage.

d. Searching Fire. --Searching fire on level or uniformly sloping terrain is accomplished in 2-mil increments. When the terrain is irregular, the beaten zones must be observed to determine the amount of search to apply between bursts.

e. Traversing and Search Fire. --Traversing and searching fire is accomplished by traversing in two mil increments and searching the amount necessary to keep the center of impact on the base of the target.

f. Swinging Traverse. --Swinging traverse is accomplished by the gunner loosening the traversing bar slide lock lever to enable him to engage

targets requiring rapid, major changes in direction. The gunner fires continuously as he slides the gun along the traversing bar. He makes minor changes in elevation with the elevating handwheel.

g. Free Gun. --Free gun is accomplished by the gunner freeing the gun both for direction and elevation by removing the traversing and elevating mechanism. He then tracks the target, leading it as necessary.

h. Bipod. --When firing from the bipod mount, regardless of the class of fire with respect to the gun, the gunner selects a series of successive aiming points on the target and fires a succession of aimed bursts covering the assigned portion of the target. He observes the width and length of the beaten zone of the initial burst and selects each succeeding aiming point a sufficient distance from the previous burst to allow an overlap of the beaten zones. Gunners can engage targets requiring swinging traverse or free gun by firing the machinegun from the shoulder, hip, or underarm position. (See par. 3303c.)

3205. POINT TARGETS

A point target can be effectively engaged by a single machinegun because it requires no manipulation. After the initial burst, the gunner keeps fire on the target, following its movement if necessary. If a heavier volume of fire is desired, both guns may be used. An example of a fire command to engage a point target is:

NUMBER ONE
FIRE MISSION
*FRONT
*MACHINEGUN
SEVEN HUNDRED
*FIXED
FIRE

*Only if not obvious.

3206. WIDE TARGETS

a. A wide target requires successive changes in direction. It is engaged with traversing fire. If the flanks of a wide target are visible to both gunners, the number one gun opens and adjusts fire on the right flank

of the target. The number two gun opens and adjusts fire on the left flank of the target. If the target is 50 mils or less in width, it is not divided. Each gun traverses in two mil increments from its respective flank to the opposite flank of the target. The target is completely covered by both guns. Each gun then reverses direction and traverses to its original point of aim. The guns continue to traverse and fire over the entire target until the squad leader commands or signals CEASE FIRE. An example of a fire command to engage such a target is:

FIRE MISSION
 *LEFT FRONT
 *SKIRMISH LINE
 FOUR FIVE ZERO
 *TRAVERSE
 FIRE

*Only if not obvious.

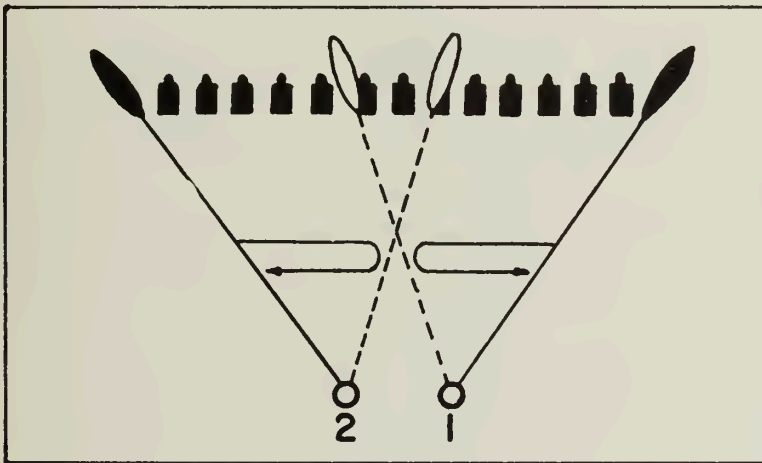


Figure 113. --Dividing a Wide Target Over 50 Mils Wide.

b. Wide targets that exceed 50 mils in width should be divided. As previously stated, division by halves is normal for targets of equal density. The initial bursts and adjustment are on the target flanks, just as in the case above. The number one (two) gun lays, opens and adjusts fire on the right (left) flank of the target. The number one (two) gun then traverses to the left (right) to the point of division. It then reverses direction and traverses to its original point of aim. If it is desired to

concentrate fire in the center of the target, each gun may be assigned two-thirds of the target. Figures 110, 111, and 112 show various methods of division. An example of a fire command to engage a wide target over 50 mils in width and of equal density is: (See fig. 113.)

FIRE MISSION

***FRONT**

***TROOPS**

SIX HUNDRED

NUMBER ONE, RIGHT HALF; NUMBER TWO, LEFT HALF

***TRAVERSE**

FIRE

*Only if not obvious.

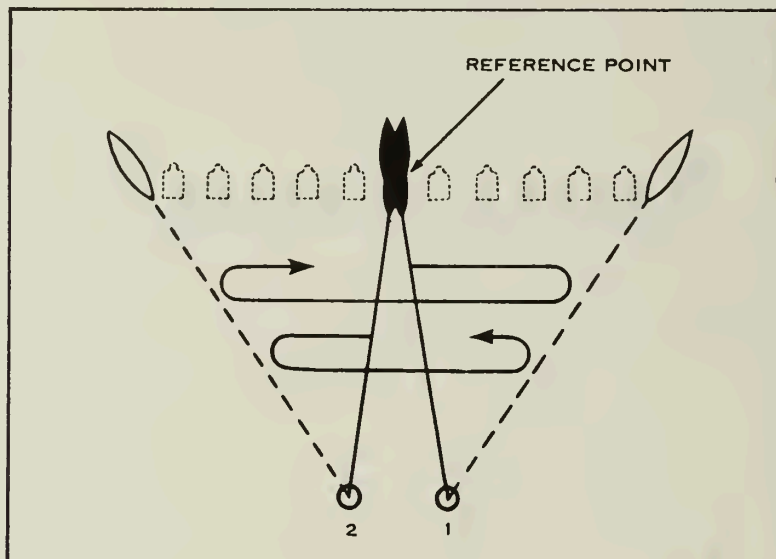


Figure 114. --Engaging a Wide Target Using a Reference Point Within the Target Area.

c. When the flanks of a wide target are indistinct, the squad leader may use a reference point to designate them. When a reference point within the target area is used, both guns open and adjust their fire on the center base of the reference point. They then traverse to their respective flanks and continue to engage the target as if the reference did not exist. An example of a fire command to engage a wide target with indistinct flanks by using a reference point within the target area is: (See fig. 114.)

FIRE MISSION
*RIGHT FRONT
REFERENCE: BUNKER; TARGET: TROOPS EXTENDING RIGHT
ONE FIVE, LEFT THREE ZERO
EIGHT HUNDRED
*TRAVERSE
FIRE

*Only if not obvious.

d. If the machineguns are being employed by teams rather than squads, single guns must engage entrie targets, regardless of width. A single gun engages a wide target as prescribed for either gun of a squad. The initial lay is on the nearest flank of the the target. The gunner then traverses across the target in two mil increments.

3207. DEEP TARGETS

a. A deep target requires successive changes in elevation. It is engaged with searching fire. If the ends of the target are visible to both gunners, the number one gun opens and adjusts fire on the near end of the target. The number two gun opens and adjusts fire on the far end of the target. Because of the length of the beaten zone, deep targets are never divided. Each gun searches from its initial point of aim to the opposite end of the target. The guns then reverse direction and search back to their original points of aim. (See fig. 115.) They continue to search up and down the target until the squad leader commands or signals CEASE FIRE. If the target is 200 meters or less in depth, the squad leader announces the range to the mid-point in his initial fire command. Both gunners set this range on their rear sights in order to engage the garget. The long beaten zone of the M60 will compensate for the difference between the actual range to either end and the announced range to the midpoint of the target. An example of a fire command to engage such a target is:

FIRE MISSION
*FRONT
*COLUMN
FIVE HUNDRED (range to the midpoint)
*SEARCH
FIRE

*Only if not obvious.

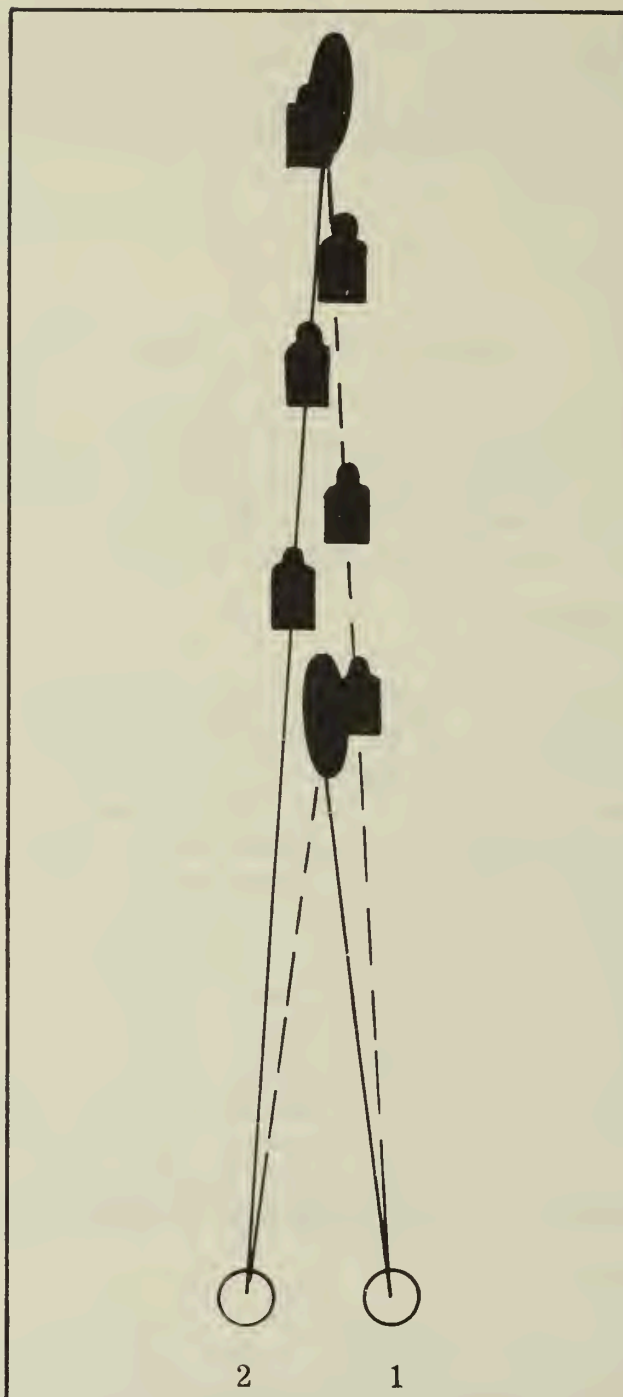


Figure 115. --Engaging a Deep Target.

b. Deep targets that are greater than 200 meters in depth are engaged in the manner prescribed above. If the target is deeper than 200 meters, the squad leader will announce separate ranges for each gun. He gives the range to the near end for the number one gun and the range to the far end for the number two gun. The gunners then place their respective ranges on their rear sights in order to engage the target. An example of a fire command to engage a target over 200 meters deep is:

FIRE MISSION

***FRONT**

***HALTED TRUCKS**

NUMBER ONE, SIX HUNDRED (range to the near end)

NUMBER TWO, NINE HUNDRED (range to the far end)

***SEARCH**

FIRE

*Only if not obvious.

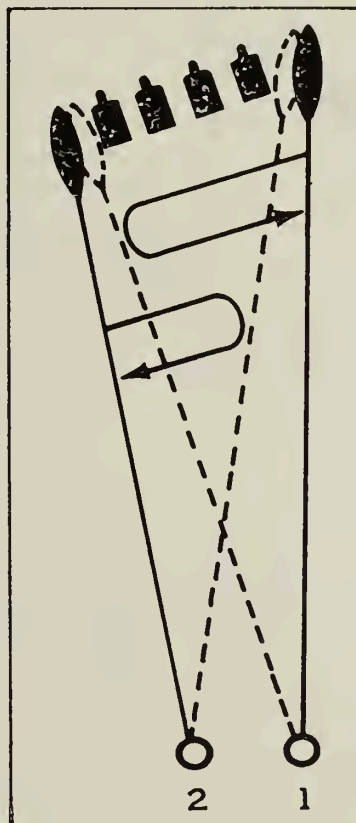


Figure 116. --Oblique Target 50 Mils or Less in Width.

c. When the ends of a deep target are indistinct, the squad leader may use a reference point to designate them. When a reference point within the target area is used, both guns open and adjust their fire on the center base of the reference point. They then search to their respective ends and continue to engage the target as if the reference did not exist. An example of a fire command to engage a deep target with indistinct ends by using a reference point within the target area is:

FIRE MISSION
*FRONT

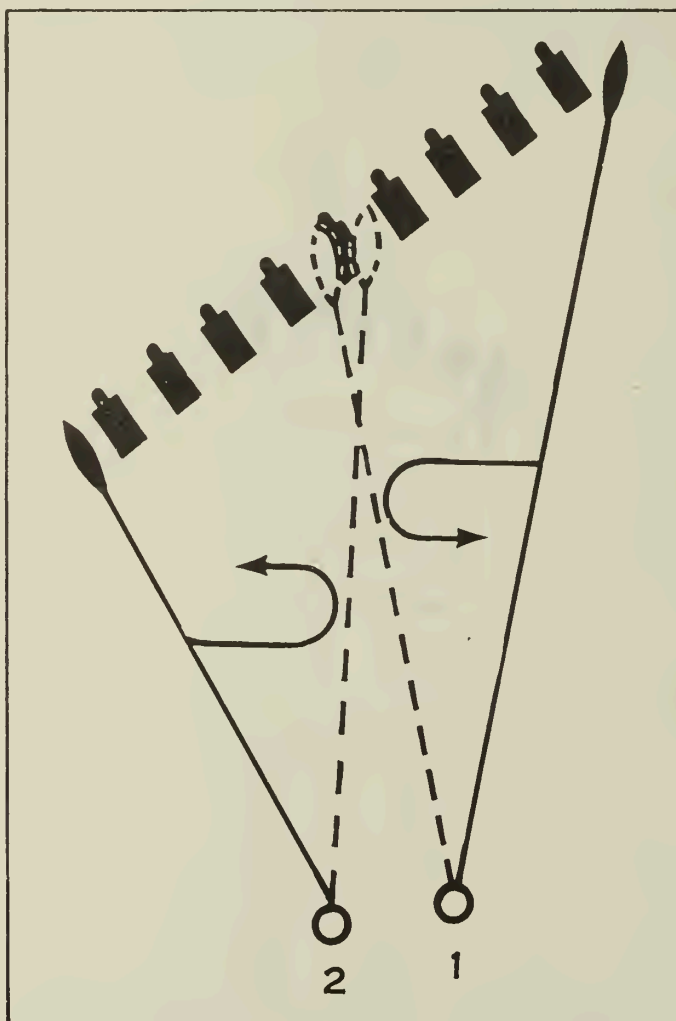


Figure 117. --Oblique Target Greater Than 50 Mils Wide.

REFERENCE: TANK; TARGET: TROOPS EXTENDING SHORT
FIVE ZERO, OVER ONE HUNDRED
EIGHT HUNDRED

*SEARCH
FIRE

*Only if not obvious.

d. If the machineguns are being employed by teams rather than squads, single guns engage deep targets as prescribed for the number one gun. A single machinegun opens and adjusts its fire on the near end of the deep target. It then searches up to the far end, reverses direction and continues to search up and down the target until the fire mission is completed.

3208. OBLIQUE TARGETS

a. Oblique targets require successive changes in both direction and elevation. They are engaged with traversing and searching fire. To engage an oblique target, the guns open and adjust their fire on their respective flanks, as if engaging a wide target. The range is announced as prescribed for engaging a deep target. The gunners traverse in two mil increments and apply enough search to keep the center of impact on the base of the target. If the width of the target exceeds 50 mils, it should be divided. If its flanks are indistinct, a reference point may be used to designate them. The engagement of an oblique target is exactly the same as the engagement of a wide target, except that the gunners search as well as traverse between bursts. (See figs. 116 and 117.) An example of a fire command to engage an oblique target less than 50 mils wide and less than 200 meters deep is:

FIRE MISSION

*RIGHT FRONT

*TROOPS

SEVEN HUNDRED (range to the mid-point)

*TRAVERSE AND SEARCH
FIRE

*Only if not obvious.

b. A single machinegun engages an oblique target by opening and adjusting fire on the nearest flank and traversing and searching over the entire target.

3209. AERIAL TARGETS

Aerial targets are engaged using the hip firing position, or free gun from the tripod and vehicular mounts. Solid tracer ammunition should be used whenever possible for ease of observation and adjustment of fire. To obtain hits on an aerial target, the gunner must aim in front of the target at a point that will cause the target and the projectiles from the weapon to arrive at the point simultaneously. (See fig. 118.) The gunner must observe the tracer stream and adjust fire as necessary.

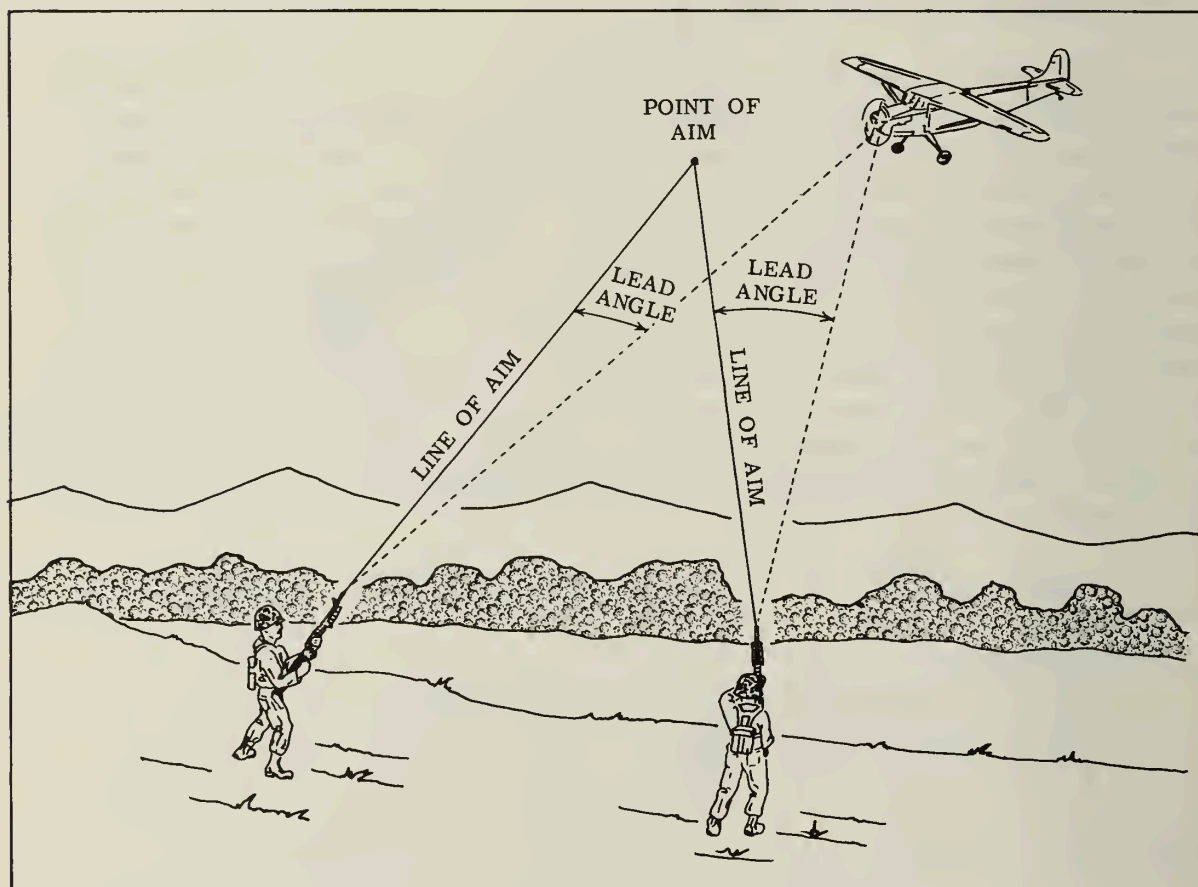


Figure 118. --Engagement of Aerial Targets.

Section III. EMPLOYMENT

3301. GENERAL

The machinegun has a variety of uses in both offensive and defensive situations. Machineguns are employed by squad whenever possible to ensure accomplishment of their assigned mission. For the same reason, constant control must be maintained over the employment of machineguns.

3302. METHODS OF EMPLOYMENT

As with any other type of support, machineguns may be employed in support of another unit in three different ways. This support to supported unit relationship is known as the "method of employment." There are three methods, each having tactical, administrative, and logistical significance as outlined below.

a. General Support. --Control is maintained by the company commander. The fires of the machineguns support any part or all of the company as directed by the company commander. This is the most commonly used method of employment for machineguns and is generally used whenever situation and terrain will permit. The company commander's control in general support is normally exercised through his weapons platoon commander through the assignment of missions. The weapons platoon commander supervises accomplishment of assigned missions by exercising tactical, administrative, and logistical control.

b. Attachment. --When terrain or tactical situation does not allow the use of all the company's machineguns in general support, some or all are normally attached to the rifle platoons. A machinegun squad attached to a rifle platoon becomes, in effect, a part of that platoon. The rifle platoon commander assumes all control; tactical, administrative, and logistical.

c. Direct Support. --The leader of a unit employed in direct support is responsible for tactical control of his unit, but missions are assigned by the leader of the supported unit. The supported unit is not responsible administratively or logistically for the supporting unit. In the case of a machinegun squad in direct support of a rifle platoon, the machineguns' mission would be assigned by the rifle platoon commander,

the machinegun squad leader would exercise tactical control for his guns in accomplishing his mission, and administrative and logistical control would remain with the weapons platoon commander. The using of machineguns in direct support within the company creates an unwieldy situation. In most cases, either general support or attachment is preferable.

3303. MACHINEGUNS IN THE OFFENSE

a. Mission. --The mission of machineguns in the offense is to support by fire the advance of the rifle platoons. These fires will fall into one or more of four general classifications:

(1) Close Support Fires. --These are fires directed against positions opposing the rifle platoons' advance. These fires are delivered as assault fires when the guns accompany the assaulting squads or fires delivered as part of the base of fire. When machineguns are used as part of the base of fire, they engage targets as previously explained in section II of this chapter.

(2) Long-Range Fires. --These are fires against targets in the rear of the hostile forward position. A long-range mission is often assigned to machineguns in the base of fire; the long-range fires commencing when friendly troops reach lateral or overhead safety limits.

(3) Flank Protection Fires. --When the location or advance of a company creates an exposed flank, the company commander may use his machineguns to protect this weakness.

(4) Protection Against Counterattack. --Enemy counterattack can be expected following seizure of an objective. Machineguns are used to protect the company's reorganization at this time.

b. Overhead Fire. --Overhead fire is fire delivered over the heads of friendly troops. The commander may use his machineguns in the overhead fire role to pin down the enemy or neutralize a target, while his troops advance underneath the friendly fire. Overhead fire is only used when troop safety is obvious. Terrain will dictate when it may be delivered safely. The rifle company commander may employ overhead fire at his discretion. He may delegate this authority to his platoon commanders when machineguns are attached to, or in direct support of, their platoons.

(1) Safety Limit

(a) After the direction of attack has been determined and the exact position of the guns has been established, the unit leader selects the safety limit. The safety limit is a point on the ground to which the leader knows friendly troops can advance safely. In order to determine the location of the safety limit, the leader must have a thorough knowledge of the characteristics of fire. (See par. 3102.) He applies this knowledge, as well as an accurate determination of range to the terrain over which the fire is to be delivered. After the safety limit has been determined, the leader notes some terrain feature so that the limit may be easily identified on the ground.

(b) During the attack, overhead fire is delivered until the friendly troops reach the safety limit on the ground. The machineguns then cease fire or shift their fire to other targets for which troops' safety is obvious.

(c) Figure 119 shows a sketch of an overhead fire situation. The target is located well above the ground over which the friendly troops will advance. The leader determines that troop safety is obvious until the advancing troops reach the safety limit. The fire is controlled, shifted, or ceased on the basis of visual observation of the leader.

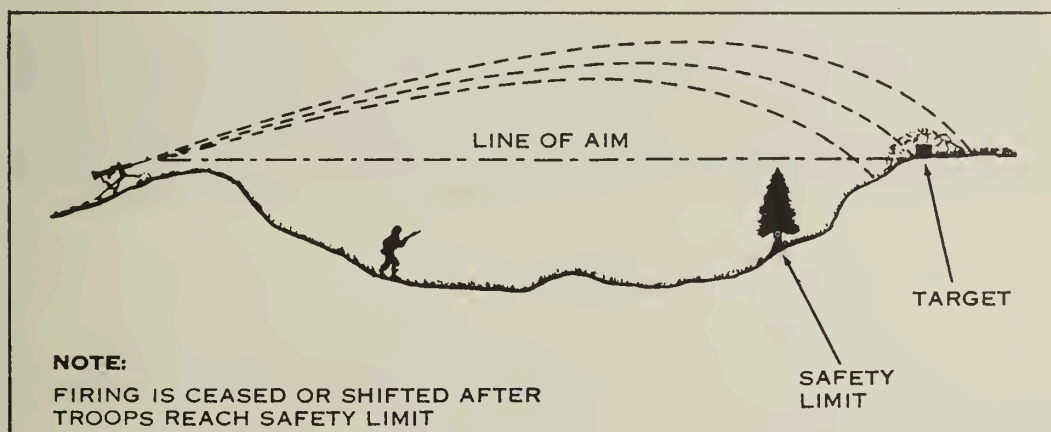


Figure 119. --Delivering Overhead Fire.

(2) Safety Precautions. --The following safety precautions must be observed when delivering overhead fire:

(a) Firmly emplace the M122 tripod mount.

(b) Use depression stops to prevent the muzzle of the gun from being inadvertently lowered.

(c) Ensure that all members of the machinegun team know the location of the safety limit.

(d) Inform the commanders of friendly troops that fire is to be delivered over their heads.

(e) Do NOT fire through trees; they are apt to cause ricochets into friendly troops.

(f) Do NOT fire if the gun-target range exceeds the maximum effective range of the gun (1,100 meters).

(g) Do NOT fire tracer ammunition at a range greater than 750 meters since its trajectory becomes erratic beyond that point.

(h) Do NOT use badly worn barrels.

(i) Do NOT cross the cones of fire over the heads of friendly troops.

c. Assault Fire. --The characteristics of the M60 machinegun allow it to deliver a heavy volume of accurate fire at assault ranges. When the guns accompany the assaulting rifle squads, they are fired from the hip, shoulder, or underarm position.

(1) Shoulder Firing Position. --When firing from the shoulder, the gunner places the hinged shoulder rest on his right shoulder. His left hand is on the rubberized handguard of the forearm assembly and his right hand is on the grip of the trigger housing. The gun is held firmly into the shoulder. Before firing, the gunner leans slightly toward the target. He fires with the rear sight raised. (See fig. 120.)

(2) Hip Firing Position. --The position of the hands is the same as for the shoulder firing position. The rear of the butt stock group is held firmly against the forward portion of the right hip. The gunner adjusts his fire by observing his tracers and the beaten zone. (See fig. 121.)



Figure 120. --Shoulder Firing Position.

(3) Underarm Firing Position. --The underarm firing position is the most desirable of the assault firing positions. Its use allows the gunner to deliver a greater volume of fire with more accuracy than either of the other assault firing positions. The position of the gunner's hands is the same as for the other positions. The rear of the receiver and the butt stock group are held firmly between the right arm and the right side of the chest. The gunner leans forward slightly before firing. (See fig. 122.)



Figure 121. --Hip Firing Position.



Figure 122. --Underarm Firing Position.

3304. MACHINEGUNS IN THE DEFENSE

a. Mission. --The mission of the company's machineguns in the defense is to provide close and continuous support for the frontline rifle platoons. Machineguns are employed by squad if the terrain will permit. All machineguns are assigned sectors of fire. Guns employed along the forward edge of the battle area (FEBA) with the frontline rifle platoons are also assigned final protective lines (FPLs). A machinegun located with reserve units or combat or general outposts is normally assigned a principal direction of fire (PDF). Some machineguns may be assigned only sectors of fire. Other guns will have sectors of fire and a final protective line. Still others will be assigned sectors of fire and principal directions of fire. Machineguns are never assigned both final protective lines and principal directions of fire. These specific assignments are discussed below.

(1) Sectors of Fire. --A sector of fire is an area to be covered by fire and is assigned to an individual or unit. All machinegun teams are assigned sectors of fire in defensive situations. The machinegun team is responsible for engaging all predetermined targets and all targets of opportunity within its assigned sector of fire. Machinegun teams are normally

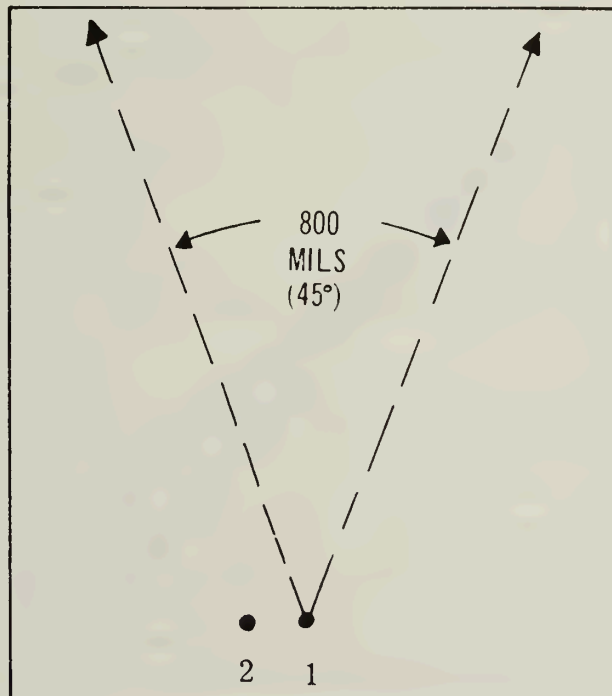


Figure 123. --Sector of Fire.

assigned sectors of fire of approximately 800 mils. Since the maximum controlled traverse on the M122 tripod mount is 975 mils and elevation is restricted by the trail legs at the extreme right and left of center, sectors of fire in excess of 800 mils should seldom be assigned. In an emergency situation, a gunner can rapidly shift his fire outside his sector by releasing the traversing and elevating mechanism and using a free gun. Every attempt should be made to leave the tripod in place, since all recorded data for predetermined fire is negated if it is moved. When the guns are employed by squads, both machinegun teams are assigned the same sector of fire. (See fig. 123.)

(2) Final Protective Lines. --A final protective line is a predetermined line of grazing machinegun fire designed to break up an enemy assault. The fire placed along a final protective line is fixed in direction and elevation and can be delivered in any condition of visibility. When fixed fire is incapable of producing maximum grazing fire because of irregularities in the terrain, up to four mils of searching fire may be employed. This will not cover dead space, but it will extend grazing fire along the final protective line. In lieu of specific instructions in Standing Operating Procedures, final protective lines are fired at the rapid rate for the first two minutes and at the sustained rate until CEASE FIRE is given. Except when other targets are being engaged, machineguns habitually will be laid on their final protective lines. Ideally, machinegun final protective lines will produce flanking enfilade fire on an enemy frontal assault. This is accomplished by assigning the inner limit of the sector of fire as the final protective line. The final protective line must be forward of the forward edge of the battle area, and should parallel it as closely as possible. The machinegun final protective lines form the basis for the defensive fires of the unit. When the machineguns are employed by squads, both machinegun teams are assigned the same final protective line. (See figs. 124 and 125.)

(3) Principal Directions of Fire. --A principal direction of fire is a predetermined line of machinegun fire covering the most dangerous avenue of approach. It may be assigned when the situation does not permit the use of a final protective line. The fire along principal directions of fire is not fixed. The gunner may employ traversing and searching fire to cover all targets in the vicinity of the principal direction of fire. The principal direction of fire is normally in the center of the sector of fire so that the gunner can completely cover the avenue of approach. The guns are habitually laid on the principal direction of fire except when other targets

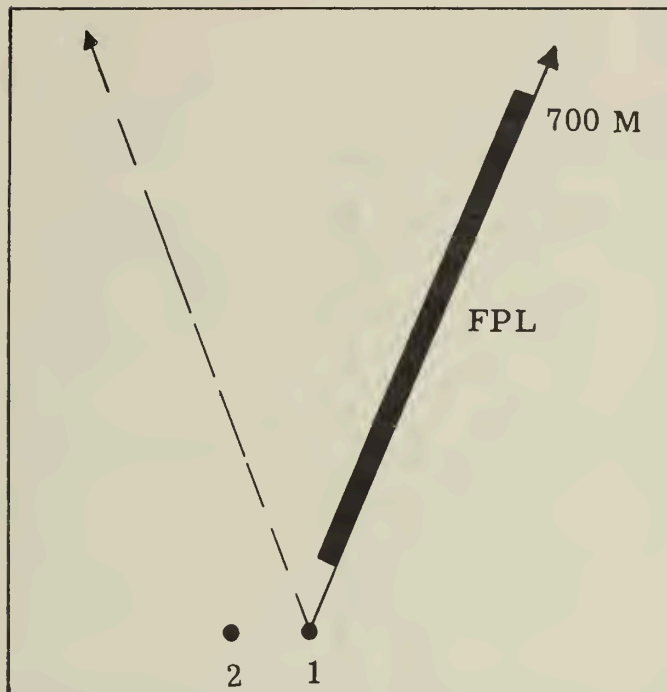


Figure 124. --Final Protective Line.

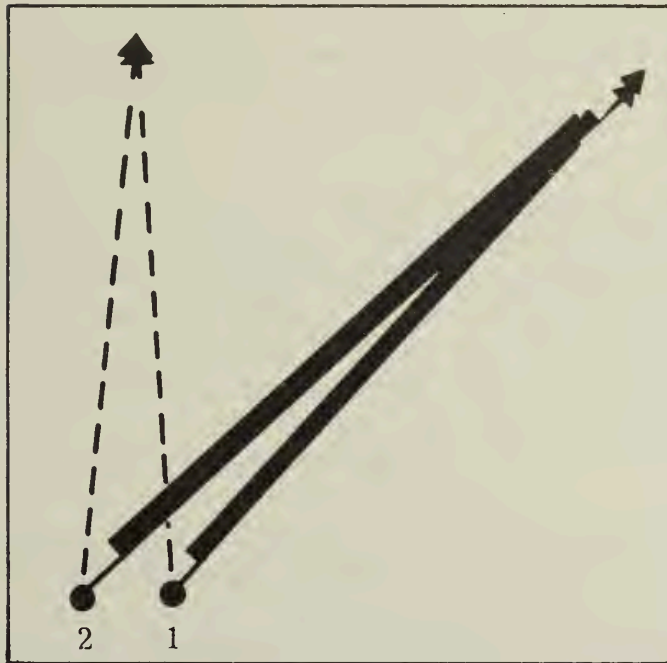


Figure 125. --Squad Sector of Fire and FPL.

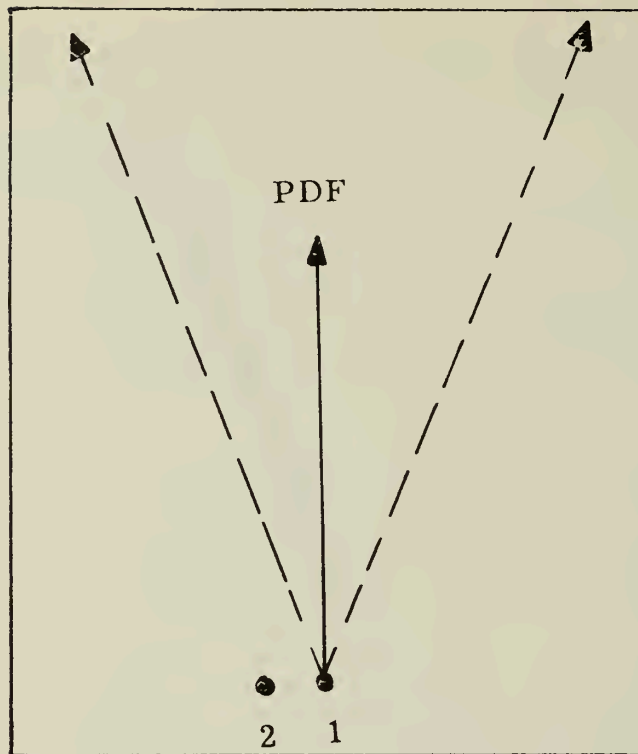


Figure 126. --Principal Direction of Fire.

are being engaged. When the guns are being employed by squads, both machinegun teams are assigned the same principal direction of fire. (See fig. 126.)

(4) Employment by Squad. --As previously stated, machineguns are employed by squad whenever possible. On defensive overlays, the sector of fire of only one gun of the squad is shown, the other gun's position is recorded as a dot. When a squad has been given a final protective line, both guns are laid on generally the same line. This is accomplished by laying one gun on the final protective line and laying the other on a distant point on the base gun's FPL. (See fig. 125.) The same technique is used to establish sector limits and principal directions of fire.

b. Preparing the Position. --The company commander designates final protective lines or principal directions of fire for the machineguns. He will also designate the general areas for the primary and supplementary firing positions. The weapons platoon commander designates the primary, alternate, and supplementary firing positions for the machinegun section, and the section leader makes the squad assignments to these areas. The

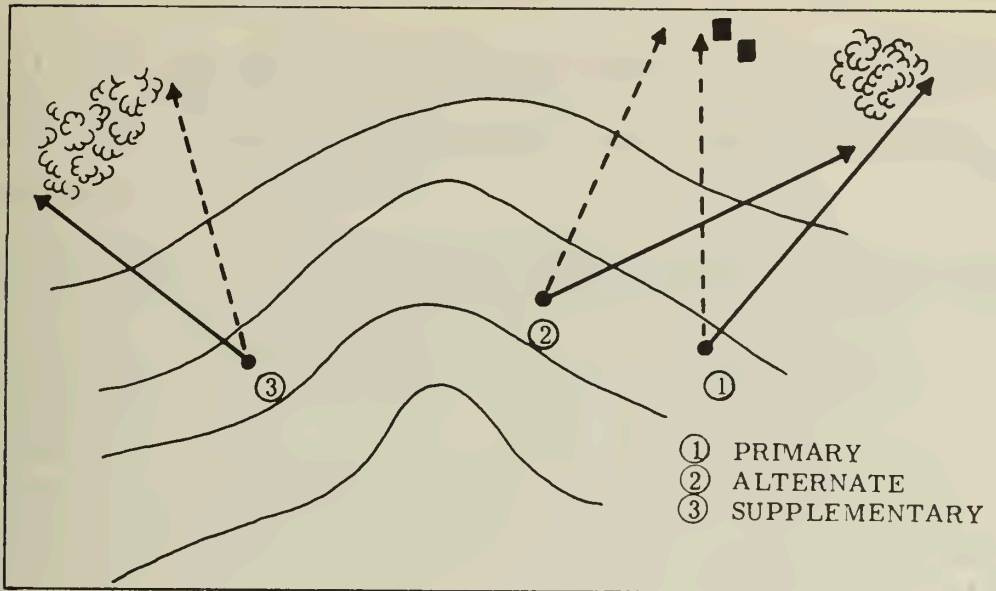


Figure 127. --Types of Positions.

squad leader points out the exact primary, alternate, and supplementary firing position for each of his guns.

(1) Types of Positions. --There are three types of positions: primary, alternate, and supplementary. (See fig. 127.)

(a) Primary firing positions are those locations on the ground that are the best suited for the accomplishment of the mission.

(b) Alternate firing positions are chosen in the event the primary positions become untenable. They are situated to accomplish the same mission as the primary. They must be located at a sufficient distance from the primary position so that fire directed at the primary position will not prevent the use of the alternate.

(c) Supplementary positions are locations from which missions other than the primary may be fired.

(2) Organizing the Position

(a) Fire Planning. --The squad leader points out the sector of fire and final protective line or principal direction of fire assigned. The guns are immediately laid to cover the sector. When possible, FPLs are walked to determine deadspace, which is recorded at once on range cards.

Two range cards are completed by each gunner. (See fig. 135.) One card is kept with the gun, the other is sent to the section leader. The rifle platoon commander in the area is notified of the location and extent of deadspace.

(b) Cover, Concealment, and Clearing Fields of Fire. --

Every effort must be made to prevent the enemy from locating the position. Movement must be kept to a minimum. Digging in commences as soon as possible, and overhead cover is constructed when possible. The ground beneath the muzzle of the gun should be wetted down or covered as a precaution against dust flying when the gun is fired. Excess oil should be removed from the gun. An oily M60 smokes heavily when hot. When clearing fields of fire, only heavier clumps of bushes and lower limbs of trees should be removed. This cut vegetation is either used in concealing the position, or carried to the rear of the position. Unnecessary clearing may disclose the position.

(3) Laying the Gun

(a) General. --In order to take full advantage of the capability of machineguns to deliver fire on predetermined targets during all conditions of visibility, it is necessary to lay the guns during conditions of good visibility. The mechanics of laying the guns on sectors of fire, final protective lines, and principal directions of fire are discussed in detail in the following paragraphs:

(b) Sectors of Fire. --To lay the gun on the limits of the sector of fire, it is unnecessary to lay for elevation. Only the direction of the sector limits need be considered. The unit leader will assign the sector of fire. The inner limit of the sector is laid first. If the inner limit is on the right, the traversing bar slide is locked on the right 450 graduation of the traversing bar. The offset head is centered on the traversing screw. The gunner raises the rear sight and aims in on his sector limit. He moves the rear legs of the tripod until his sights are on the sector limit. He then emplaces the rear legs of the tripod. If the inner sector limit is on the left, the traversing bar slide is locked on the left 425 graduation of the traversing bar, and the process described above is completed. To lay the gun on the outer sector limit, the gunner moves the traversing and elevating mechanism along the traversing bar until his sights are on the sector limit. He then places limiting stakes on the sector limits so that his machinegun cannot be traversed outside of his sector of fire.

(c) Final Protective Lines

1 Direction. --The machinegun is laid for direction as prescribed for laying on the inner sector limit above.

2 Elevation. --If the ground is level or uniformly sloping to a range of 700 meters, the gunner sets the rear sight at 700 meters. He selects a point on the ground which he determines to be at a range of 700 meters, lays the gun, and fires and adjusts on this point. If there is a break in the terrain at a range less than 700 meters (whether the ground breaks up or down), the gunner estimates the range to the break in the ground, places this range setting on the rear sight, lays the gun, and fires and adjusts on the break. When the center of impact hits the break, he ceases fire and then elevates the gun two mils. This provides grazing fire up to the break in the ground and for some additional distance beyond. (See figs. 128 and 129.)

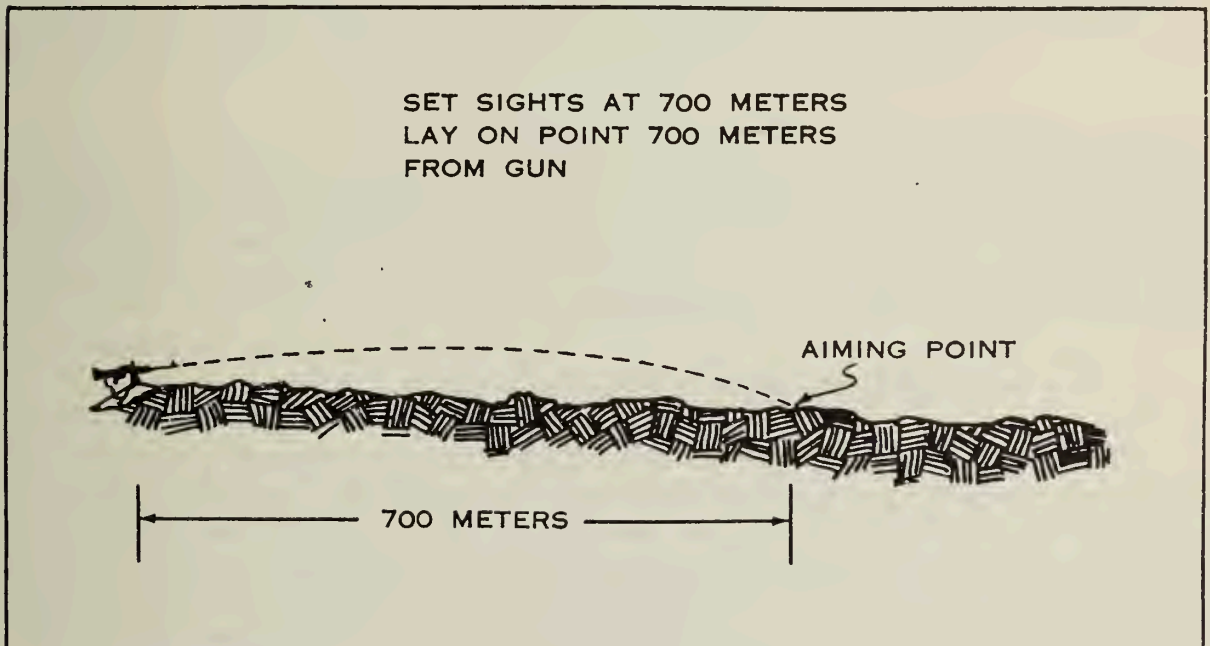


Figure 128. --Method of Laying Gun for Grazing Fire When Ground is Level or Uniformly Sloping.

(d) Principal Directions of Fire. --The gun is laid for direction by locking the traversing bar slide on the zero graduation of the traversing bar. The gun is then laid by sighting on the principal direction

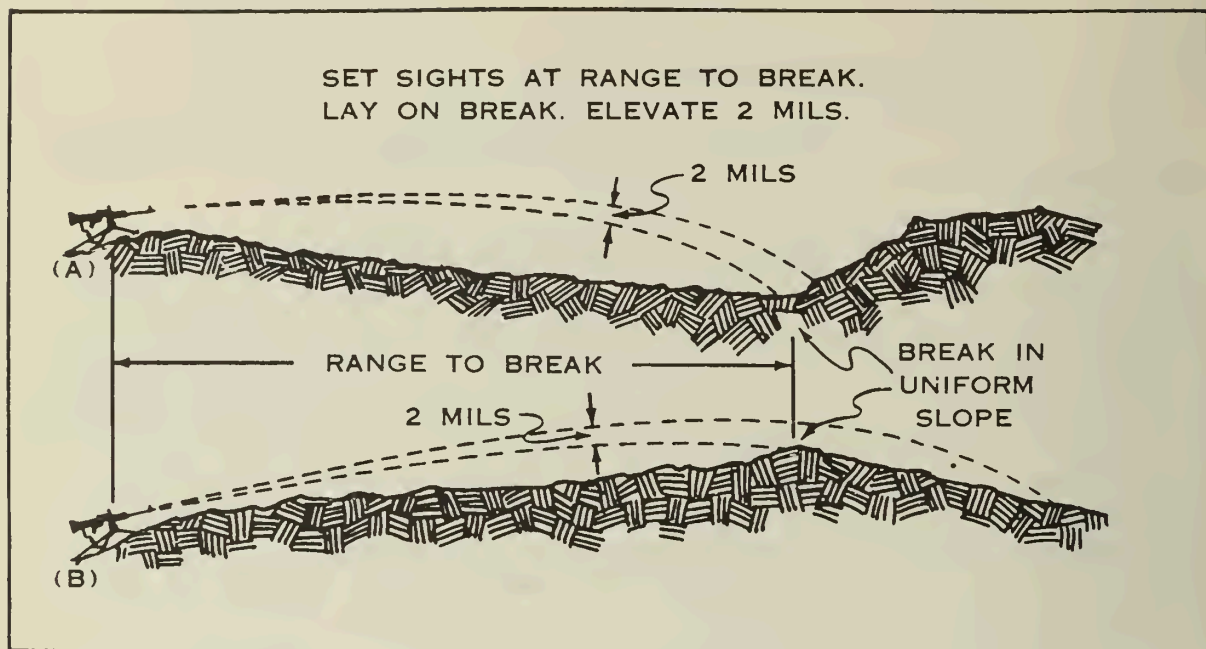


Figure 129. --Method of Laying Gun When There are Breaks in the Ground at a Range Less Than 700 Meters.

of fire and shifting the tripod as prescribed for laying on the inner sector limit above. Laying for elevation is accomplished by firing the gun and adjusting the center of impact onto the near end of the avenue of approach constituting the principal direction of fire. The gun is then searched up and down the principal direction of fire.

(4) Firing on Predetermined Targets

(a) General. --The machinegun can deliver fire on predetermined targets during all conditions of visibility. To deliver predetermined fire, the gun is fired on the targets during conditions of good visibility. A record is kept of the information necessary to refire the gun at the various targets. By reapplying this information to the gun, any predetermined target may be engaged. The methods used to accomplish this process are discussed below.

(b) Traversing Bar and Elevating Mechanism Method

1 General. --Direction and elevation readings make up the predetermined data needed. These readings are measured by using

the traversing bar, traversing handwheel, and the elevating mechanism on the tripod mount. The mil is the unit of measurement used. Before direction and elevation readings are obtained, the traversing mechanism must be centered, the gun laid for direction on the final protective line, principal direction of fire, or the center of the sector, and the tripod mount properly emplaced. Once the gun is laid for direction, the tripod must be firmly emplaced to ensure accurate fire. If the tripod is moved after data has been determined and recorded, the data will not be valid.

2 Direction Readings. --Lay the gun on the FPL or the center of the sector. When the gun is laid to engage the FPL, the direction reading is LEFT 425 or RIGHT 450. The FPL is regarded as Target Number One and all other targets are numbered in sequence from the FPL. If no FPL is assigned, targets are numbered from either sector limit. Lay on the next target by loosening the traversing bar slide lock lever. If the left edge of the traversing bar slide falls on a 5-mil graduation on the traversing bar, lock the slide there and fire and adjust on the base of the target. Make any necessary adjustments for direction on the traversing handwheel.

a Example. --To lay the gun on a target, the left edge of the slide is placed on the LEFT 300 graduation on the traversing bar. During the adjustment of fire, the gunner pulled the traversing handwheel a total of three clicks (mils) in order to place the center of impact on the center base of the target. The direction reading would be LEFT 303, since the original lay was LEFT 300 and the gunner further traversed the muzzle of the gun to the left a total of three mils. Had the gunner pushed instead of pulled the traversing handwheel three clicks during the adjustment of fire, the correct reading for direction would be LEFT 297. If the left edge of the traversing bar slide falls between two graduations on the traversing bar during the initial lay, always move the left edge of the traversing bar slide back to the smaller of the two graduations. Then use the traversing handwheel to complete the initial lay. This technique keeps the muzzle of the gun moving in the same direction when laying on a target.

b Example. --To lay the gun on the target, the left edge of the traversing bar slide falls between the RIGHT 100 and the RIGHT 105 graduations on the traversing bar. The gunner places the left edge of the traversing bar slide on the RIGHT 100 graduation and uses the traversing handwheel to move the muzzle of the gun further to the right to complete the initial lay. Assuming he traverses right three mils, this

number of mils is added to the traversing bar reading. The direction reading is now RIGHT 103. If the gunner fires and adjusts on the target and uses the traversing handwheel to manipulate the muzzle of the gun to the left, the number of clicks is subtracted from the reading of RIGHT 103. When the traversing handwheel is used in laying the gun on a target, it must be recentered prior to laying the gun on the next target.

3 Elevation Readings

a Obtain the elevation reading from two indexes. Take the first portion of the reading from the engraved scale on the upper elevating screw plate. Take the second portion from the engraved scale on the elevating handwheel, using the indicator as the index. The two portions of the elevation readings are separated by a slash (/) when they are recorded.

b The engraved scale on the upper elevating screwplate is graduated in 50-mil increments from MINUS 200 to PLUS 200.

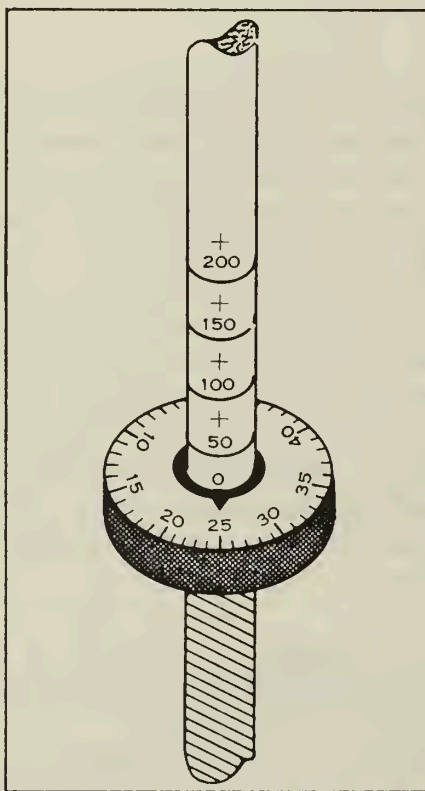


Figure 130. --Elevating Mechanism.

There is an index line below each number and a PLUS or MINUS sign above each number, with the exception of the "0". (See fig. 130.) In obtaining the elevation reading, lower the head until the eyes are on line with the top of the elevating handwheel. Notice the first index line on the engraved scale of the upper elevating screw plate that is completely visible, and record the number above that first index line, with the PLUS or MINUS sign (if any) as the first portion of the elevation reading. In the example shown in figure 130, this portion of the elevation reading would be recorded as PLUS 50/.

c The elevating handwheel is graduated in one mil increments for a total of 50 mils. Look at the graduation on the engraved scale of the elevating handwheel that is on line with the indicator. This number is recorded after the slash as follows: PLUS 50/25.

d This elevation reading is valid only for this one gun. If the tripod is moved, the data will be inaccurate. The number of threads exposed on the lower elevating screw must remain the same. If this number of threads is increased or decreased after the data is recorded, then new data must be obtained.

e To replace the elevation reading of PLUS 50/25 on the gun, manipulate the elevating handwheel so that the line below the PLUS 50 is visible at eye level with the handwheel indicator on the 25 graduation.

(c) Aiming Stake Method

1 An aiming stake may be used to lay the gun on the target under all conditions of visibility. A small strip of luminous tape, a spot of luminous paint, or some other suitable material is placed on the top front side of the stake to establish an aiming point during poor visibility. The principal advantage offered by the aiming stake method is that no light is required at the gun position at night. An aiming stake is normally placed out for all targets and the limits of sector. Aiming stakes are always given target numbers.

2 With the gun laid to hit the target, the squad leader or team leader sets the rear sight slide in its uppermost position and clears the gun carefully so as not to disturb the lay. A small strip of luminous tape is secured near the base of the front sight, but not so low as to permit the flash suppressor to interfere with the correct sight picture. With

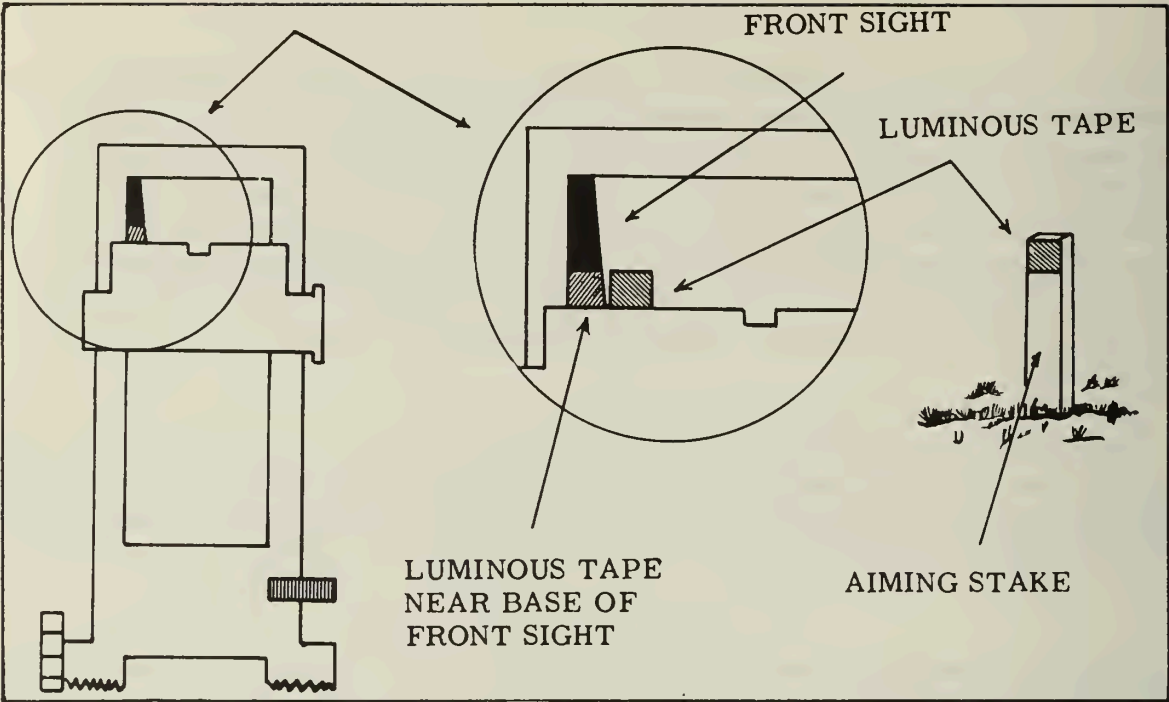
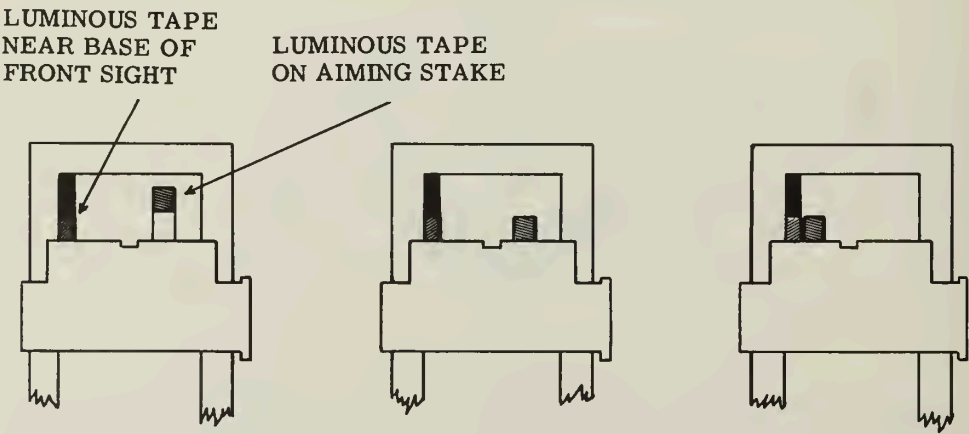


Figure 131. --Aiming Stake Method - Emplacing the Stakes.

the gunner in the correct position, a stake is placed in front of the gun position and driven into the ground until the correct sight picture is obtained. (See fig. 131.) The gunner must maintain the correct position and grip and pressure during the entire procedure.



(A) STARTING POSITION (B) ALIGN FOR ELEVATION (C) CORRECT LAY

Figure 132. --Relaying the Gun Using the Aiming Stake Method.

3 To relay the gun at any time, the gunner sets the rear sight slide in its uppermost position and manipulates the lay of the gun as shown in figure 132.

(d) Base Stake Method. --The base stake method defines the sector limits and provides the correct lay for the final protective line or other targets which appear along a sector limit. No light is required at the gun position at night. Lay the gun for direction along one sector limit and emplace a stake along the outer edge of the folded bipod legs, taking up the "give" as the legs rotate slightly on the barrel. Use the same procedure for placing a stake along the opposite sector limit. If the final protective line or another target requires the same directional lay as a sector limit, fix the elevation by driving a stake so the top of the stake is under the gas cylinder extension. This prevents the gun from being depressed below the desired lay. (See fig. 133.)

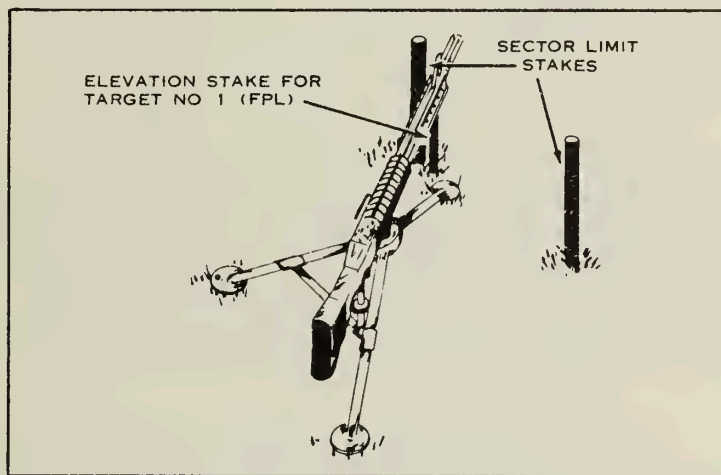


Figure 133. --Base Stake Method.

(e) Stake and Notched Stick Method

1 This method requires a parapet in front of the gun. The notched stick fixes the direction to the final protective line and other targets. The parapet serves as a fixed starting point from which clicks of elevation are counted for each lay of the gun. (See fig. 134.)

2 Lay the gun on the final protective line and drive a stake into the ground outside the rear leg of the tripod closest to the butt

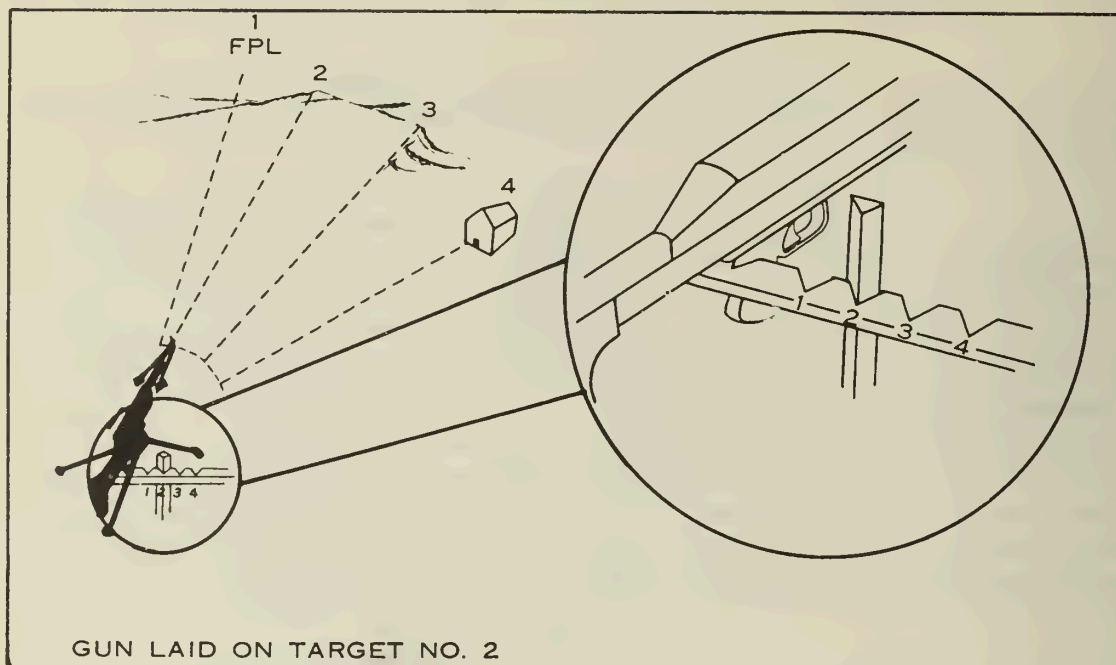


Figure 134. --Stake and Notched Stick Method.

stock of the gun. To establish direction for target number one (FPL), cut a rounded notch near one end of a straight stick. This allows the stock to be held level while the rounded notch engages the collar of the trigger housing group. Mark the place on the stick where it touches the stake and cut a V-notch there and number it to correspond to the target number. To establish direction for other targets within the sector, use the same procedure.

3 Once the gun is laid for direction, determine elevation by depressing the gun until the muzzle of the gun rests on the parapet. Count the number of clicks of elevation until the lay of the gun is on the target. Record this number of mils. Follow the same procedure for all targets within the sector.

4 To place the desired data on the gun at night, use the notched stick to obtain direction. Lay the gun for elevation by adding the desired number of clicks (mils) from the parapet, being careful not to disturb the directional lay of the gun.

(f) Range Cards. --The range card is a record of the firing data necessary to engage the final protective line and all other likely targets within the gun's sector of fire. Regardless of the anticipated length

of time that the gun crew will occupy a position, preparation of the range card begins immediately. Revisions and improvements are made constantly during occupation of the position. It is sketched in duplicate on any available material. One copy remains at the gun position and the other copy is sent to the company headquarters. It is necessary to orient the gun position, sector of fire, and final protective line accurately. A range card is prepared for each gun. Partially completed range cards are also prepared for supplementary gun positions. The gunner, assisted as necessary by the squad leader, is responsible for making the range cards.

1 Preparation. --Figure 135 shows a range card prepared for number two gun of a squad. The gunner has used only the traversing bar and elevating mechanism method for establishing direction and elevation to all targets.

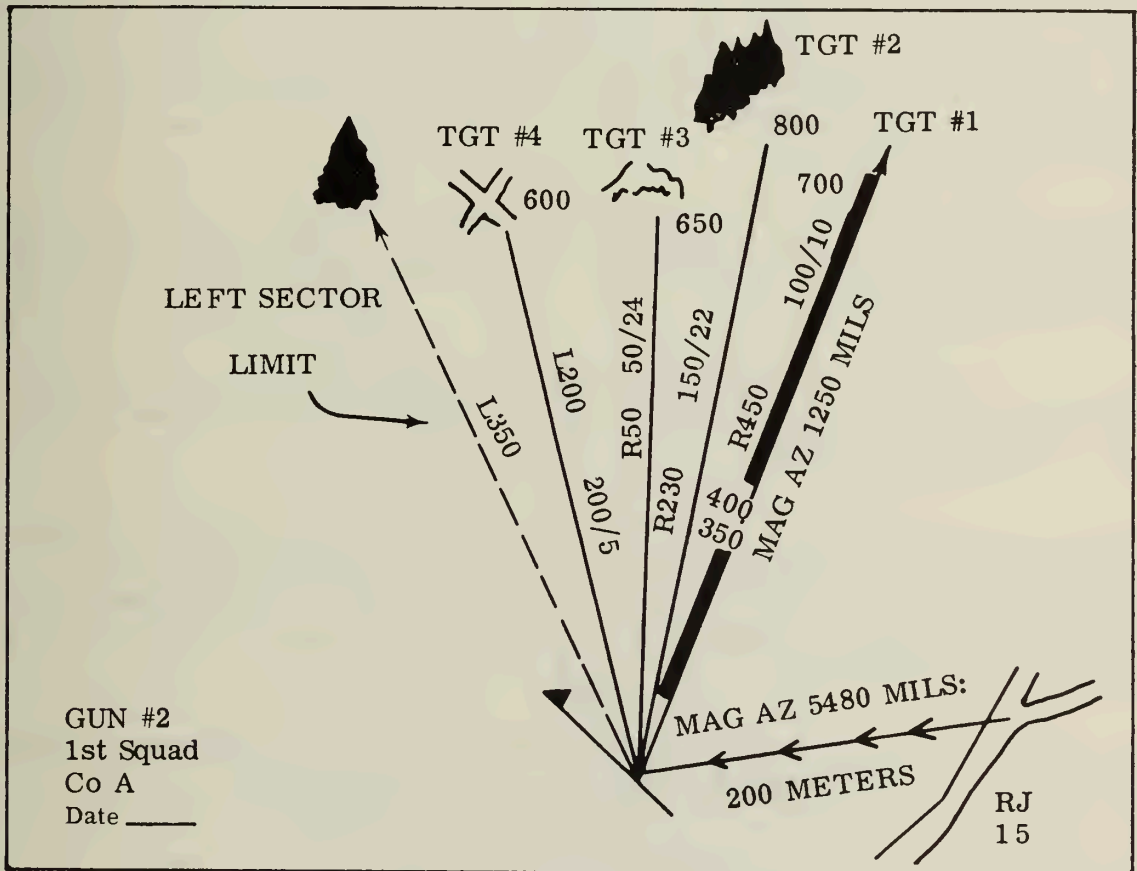


Figure 135. --Range Card Using Traversing and Elevating Mechanism Method.

a Record the gun number, unit designation, and date. For security reasons, show no higher unit designation than the company.

b Draw the machinegun symbol in the lower center portion of the card. This is drawn in the direction of the FPL, principal direction of fire, or the center of the sector, whichever is applicable.

c Draw a magnetic north arrow through the gun position (base of the machinegun symbol).

d Orient the gun position with a prominent terrain feature by measuring the magnetic azimuth from the gun position to the terrain feature. Determine the back azimuth and the distance in meters to the terrain feature. Sketch the terrain feature on the card. Record the back azimuth in mils and the distance in meters along a line drawn between the two points. Arrow barbs indicate the direction in which the magnetic azimuth is to be read.

e If some terrain feature appears near the right and left limits of sector, sketch them on the card. Draw in the right and left limits of sector.

f Measure and record the magnetic azimuth of the final protective line, principal direction of fire, or the center of the sector, whichever is used.

g Determine and record the extent of grazing fire along the FPL and place a heavy line to indicate this grazing fire along the inner side of the line representing the FPL. Leave a gap in the heavy line to indicate deadspace, and record the ranges to the near and far ends of the deadspace.

h Determine and record the direction and elevation readings for engaging the FPL.

i Label the FPL as target number one.

j Obtain and record the direction reading for the opposite limit of sector. No elevation is required, since this is a limiting point only and not subject to predetermined fire.

k Sketch in all targets for which data is to be determined. Number all targets in sequence from the FPL. Draw in a straight line from the gun position to the base of each target.

l Determine and record the range, direction and elevation readings, and the width and/or depth of all targets.

m Sketch and label the location of any friendly troops in or near the sector of fire. Figure 136 shows a range card

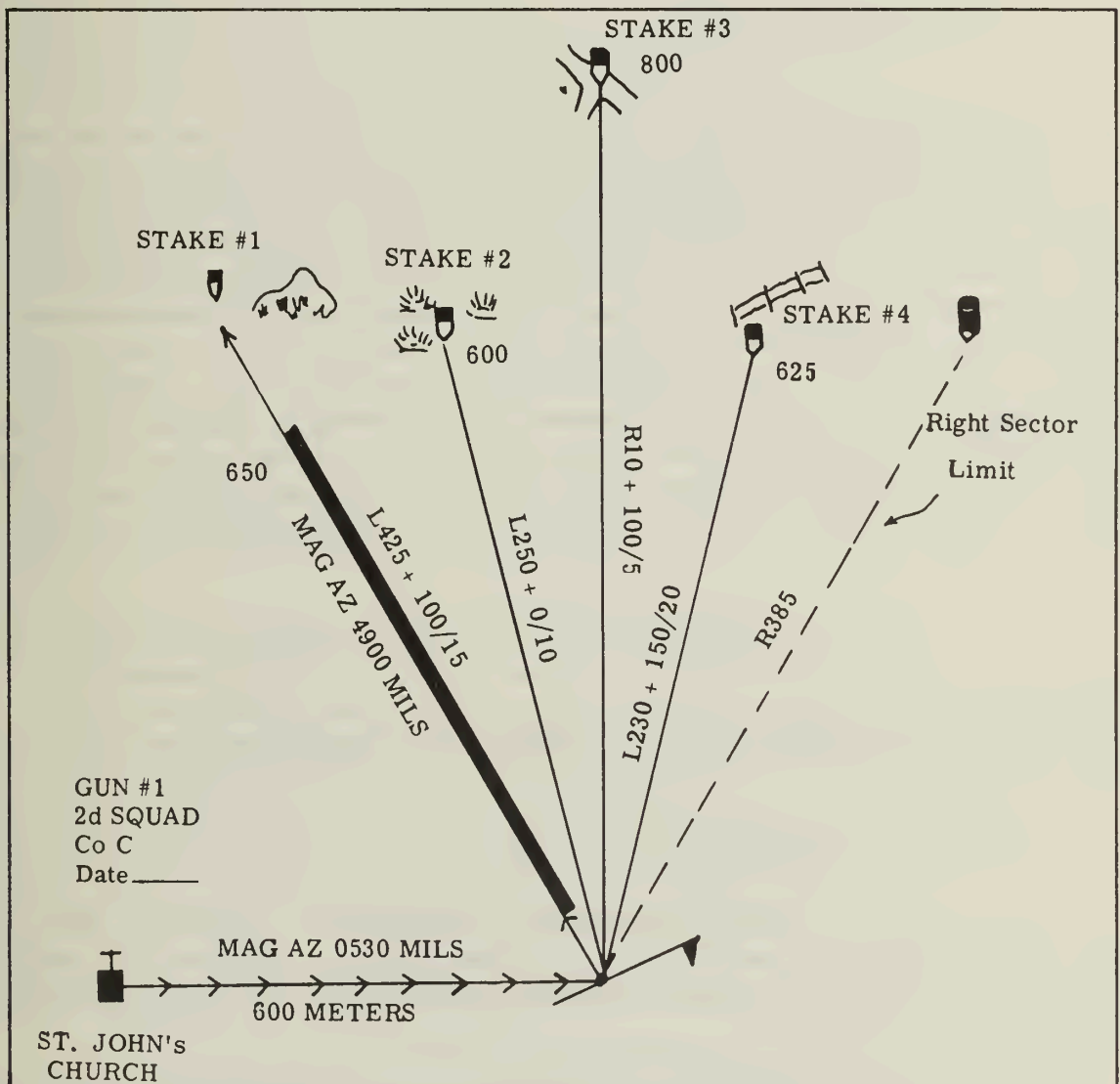


Figure 136. --Range Card Using Aiming Stakes and Traversing and Elevating Mechanism Methods.

prepared for the number one gun of a squad. The gunner has used both the traversing bar and elevating mechanism method and the aiming stake method for establishing direction and elevation to all targets. When aiming stakes are used, the stake numbers assume the number of the respective targets. If a stake is used for a sector limit that is not a target, special markings should be placed on the stake to indicate this. Information needed to engage targets by using field expedient methods is also recorded on the range card.

(5) Defilade Fire

(a) General. --This paragraph is designed to provide a method of establishing direction and elevation in those special situations; e. g., rifle company in reverse slope defense; when it will be most advantageous to employ machineguns in position defilade. Normally, in order to achieve maximum effectiveness, the machineguns must be employed using the technique of direct lay. A machinegun is in position defilade when the gun and its crew are hidden from enemy ground observation by an obstacle such as the crest of a hill. Adjustment of fire is made by an observer standing at or near the gun who can see the target. The position may be on the reverse side of the mask, or the forward slope of the next high ground in rear of the mask, or in a small fold in the ground. (See fig. 137.) The machinegun on bipod mount is not fired from position defilade due to the difficulties encountered in adjusting fire when the gunner cannot see the target.

(b) Advantages. --The gun crew has concealment and cover from aimed small arms fire. The crew has some freedom of movement in the vicinity of the position. Control and supply are facilitated. The characteristic smoke and flash of the gun is less easily observed by the enemy.

(c) Types of Position Defilade

1 Maximum Position Defilade. --A gun is in maximum position defilade when it is at the lowest point on a slope from which it can engage the target. It has relatively good cover, but lacks flexibility in engaging new targets.

2 Minimum Position Defilade. --A gun is in minimum position defilade when it is at the highest point on a slope at which position

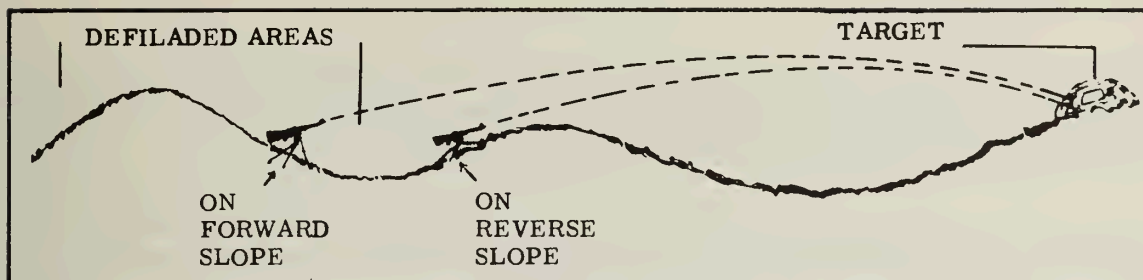


Figure 137. --Minimum Position Defilade.

defilade can be obtained. It has flexibility in engaging new targets, although it does not possess maximum cover. (See fig. 137.)

3 Partial Defilade. --A gun is in partial defiladed position when a mask provides the gun and crew with some protection from enemy direct fire, and the gunner is able to engage the target by direct laying techniques. (See fig. 138.)

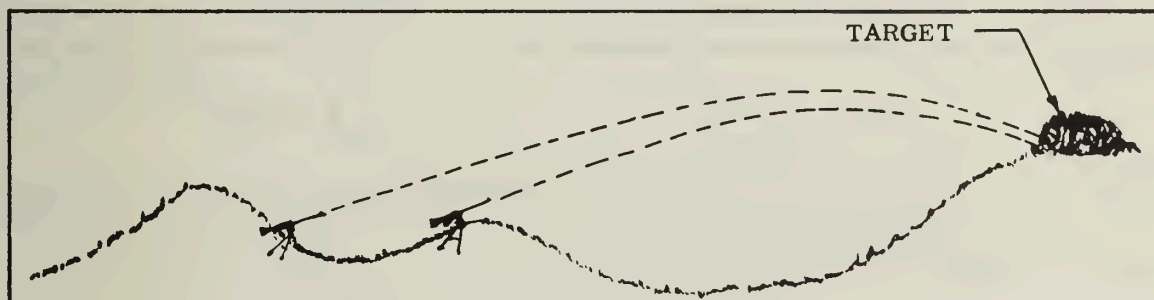


Figure 138. --Partial Defilade.

(d) Firing From Position Defilade. --The essential elements in the engagement of a target from position defilade are mask clearance, direction, elevation, and adjustment of fire. If possible, a minimum mask clearance (minimum elevation) will be determined for the entire sector of fire. However, it may be necessary due to the slope of the mask to establish clearance for each individual target.

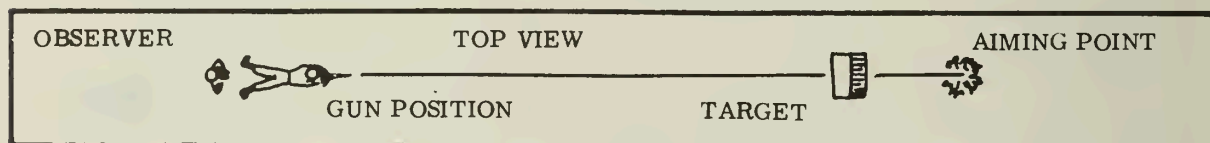
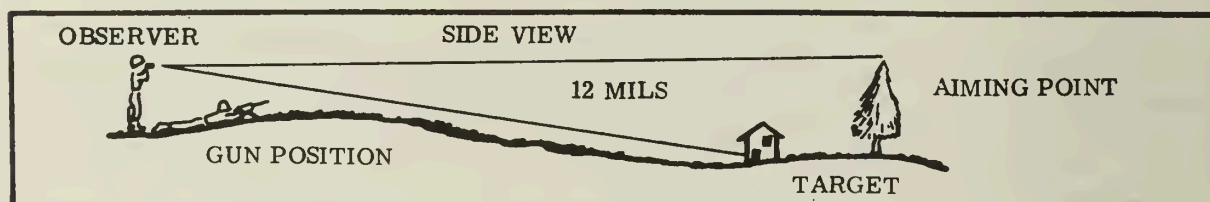
1 Establishing Mask Clearance

a If the mask is 300 meters or less from the gun position, place a 300-meter range setting on the rear sight, lay on the top of the mask, and add three mils of elevation.

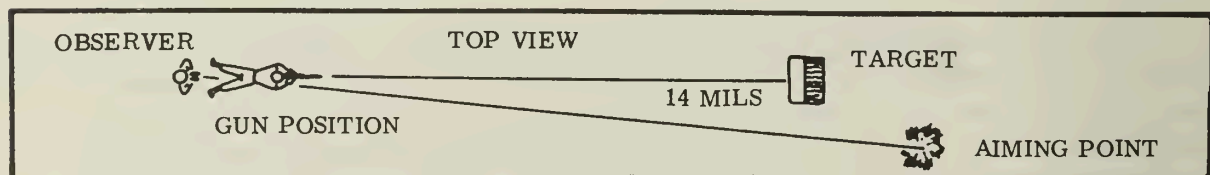
b If the mask is over 300 meters from the gun position, place the range setting to the mask on the rear sight, lay on the top of the mask, and add three mils of elevation.

c The elevation readings obtained, using the methods outlined above, give the minimum elevation for the sector or targets. The minimum elevation should be recorded.

2 Laying the Gun for Direction. --The observer places himself on the gun-target line and in a position where he can see the gun and the target. He aligns the gun for general direction by directing the gunner



- 1 - AIMING POINT ON LINE GUN-TARGET.
 RANGE GUN-TARGET IS 1,000 METERS.
 DIRECTION: WITH REAR SIGHT SET AT 1,000 METERS,
 LAY GUN ON AIMING POINT.
 ELEVATION: DEPRESS GUN 12 MILS.



- 2 - AIMING POINT IS NOT ON LINE GUN-TARGET.
 RANGE GUN-TARGET IS 1,000 METERS.
 TARGET IS 14 MILS LEFT OF AIMING POINT.
 DIRECTION: WITH REAR SIGHT SET AT 1,000 METERS,
 LAY GUN ON AIMING POINT. TRAVERSE
 GUN LEFT 14 MILS.
 ELEVATION: DEPRESS GUN 12 MILS.

Figure 139. --Firing From Position Defilade.

to shift the mount and/or gun until it is aligned on the target. A prominent landmark, visible to the gunner through his sights, is selected as an aiming point. An aiming point on the gun-target line at a greater range and higher elevation than the target is selected.

a If the aiming point is on the gun-target line, the gun is laid on the aiming point and is thereby aligned for direction.

b If the aiming point is not on the gun-target line, the horizontal distance in mils is determined and announced to the gunner. This measured distance is then laid off with the gun.

c When laying the gun on the aiming point, the range setting on the rear sight must correspond to the range to the target.

3 Laying the Gun for Elevation. --The observer measures the vertical distance from the aiming point to the base of the target and directs the gunner to depress the muzzle of the gun through the number of mils measured. The gun should now be laid to hit the target. (See fig. 139.)

4 Adjustment of Fire. --Fire is adjusted by the squad leader or a member of the machinegun team acting as an observer. The observer adjusts fire by informing the gunner to move left or right and add or drop the number of mils necessary to bring the fire onto the target.

3305. DUTIES OF LEADERS

a. Section Leader. --The machinegun section leader is responsible to the platoon commander for all the actions and needs of the men in his section. He closely coordinates and controls his three machinegun squads to ensure providing the most effective fires in support of the company scheme of maneuver in the attack. The section leader generally positions himself centrally where he can best observe and control all three machinegun squads, or at the most critical point of activity. If all machineguns are attached, the section leader will be in the vicinity of the weapons platoon commander.

b. Squad Leader. --The squad leader is responsible to the section leader for the actions and control of his men who constitute his two machinegun teams. In the general support role, he carries out the assigned

mission by assigning specific gun positions to his squad, designation of targets to his machinegun teams, supervision of occupation and preparation of squad positions, coordination and control of his squad fires, searching for and engaging of targets of opportunity, and supervision of displacement. When the machinegun squad is attached, the squad leader carries out the mission assigned by the commander of the unit to which he is attached. He must closely coordinate with that supported unit commander and be prepared to advise, if called upon, on the most effective means for utilizing his guns in support of the attack.

c. Team Leader. --The team leader is responsible to the squad leader for the actions and control of his men. He supervises the preparation and occupation of firing positions, directs and controls the fires of his team, and takes all actions necessary to keep his gun in operation. In addition to controlling his fires, he must also maintain observation with his squad leader for fire commands or further instructions.

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